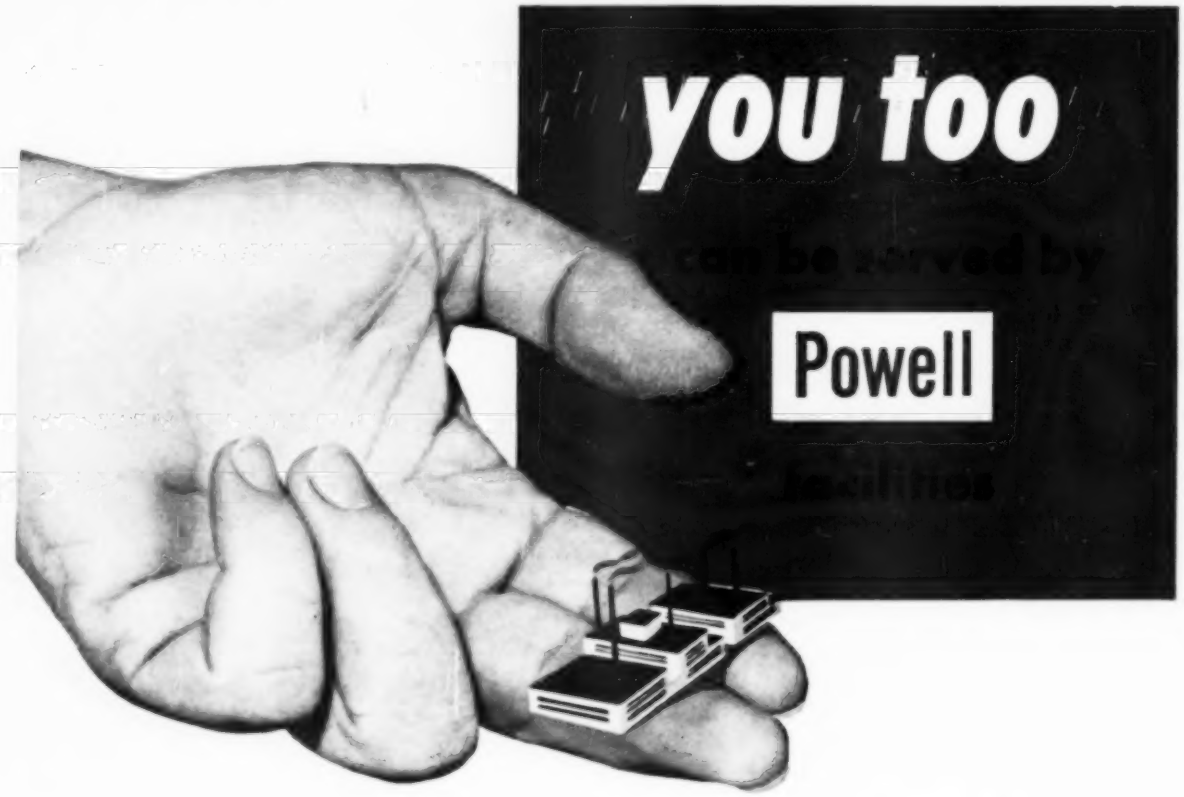
Vol. 8, No. 1 JANUARY, 1953

AGRICULTURAL CHEMICALS

In This Issue:



Modern manufacturing plants, fully equipped to produce high quality insecticide concentrates, strategically located to offer you these key benefits:

SERVICE —swift delivery from near-by plants. Technical service to help solve your formulation problems.

QUALITY —laboratory-controlled *new production* concentrates for full insecticidal effectiveness and trouble-free formulation.

PRICE —our prices are calculated to make *you* competitive.

CONTRACT —assured source of supply in case of shortage; quantity price with price protection.

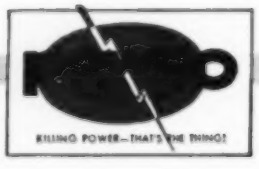
You too can enjoy all the benefits of doing business with the one leading manufacturer who does not compete with you.

John Powell & Co., Inc.

ONE PARK AVENUE, NEW YORK 16, N. Y.

Sales Offices: Philadelphia • Pittsburgh • Chicago • Huntsville • Fort Worth • Omaha • San Francisco • Atlanta

Representatives in Principal Cities of the World



DDT • TOXAPHENE • BHC • CHLORDANE • LINDANE • ROTENONE • SABADILLA • PYRETHRUM & PYRIN • ANTU
PIPERONYL BUTOXIDE • ALLETHRIN • TEPP • PARATHION • ALDRIN • DILAN • HEPTACHLOR • 2, 4-D & 2, 4, 5-T.

LOOK TO POWELL...FOR CONSISTENT, TROUBLE-FREE QUALITY

LEST WE FORGET

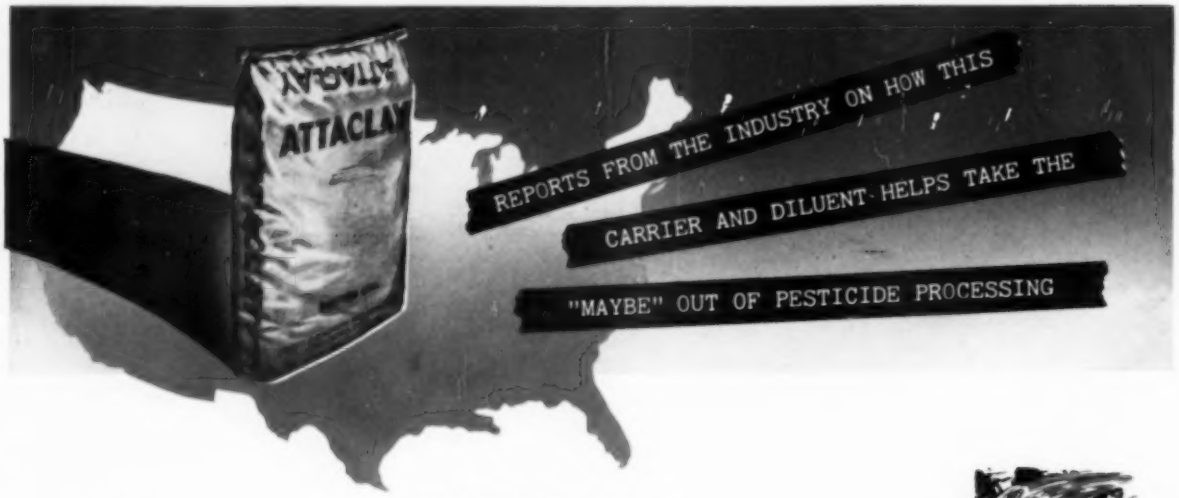
Throughout the past year we have talked about Grassland Farming. This pasture program is and continues to be of Prime Importance to all of us in Agriculture.

Corn, Cotton, Tobacco, Wheat and other crops are old standbys which we are not forgetting in our zeal to promote Green Pastures.

Potash Company of America will continue to cooperate with the Fertilizer Industry and other agencies to further the cause of all Agriculture.

POTASH COMPANY OF AMERICA
Carlsbad, New Mexico

GENERAL SALES OFFICE . . . 1625 Eye Street, N. W., Washington, D. C.
MIDWESTERN SALES OFFICE . . . First National Bank Bldg., Peoria, Ill.
SOUTHERN SALES OFFICE . . . Candler Building, Atlanta, Ga.



These plants cash in on Attaclay's over-all flexibility and efficiency

LOCATION: Pacific Northwest

PLANT MANAGER: *We make many products, yet inventory only one carrier and diluent—Attaclay. It does so many jobs so well that advantages show up all along the line—from simplified procurement to better finished products.*

LOCATION: South Central U. S.

PRODUCTION SUPERINTENDENT: *There was a time we used several diluents in addition to Attaclay. Then adverse weather left us with a heavy inventory of non-Attaclay DDT and BHC bases that caked on storage, all of which had to be re-worked. This unhappy experience sold us on using Attaclay across the board.*

LOCATION: Mississippi

PLANT MANAGER: *We've standardized on Attaclay for bases and finished dusts. And take my word for it, we have fewer problems in material scheduling and handling—less chance of errors occurring in formulating.*

LOCATION: Pennsylvania

MANAGER: *While our research division insists upon Attaclay for many of our products, we in the manufacturing end of the operation are convinced we can save money by using Attaclay in all dust bases and wettable powders.*

Make Attaclay *your* unified source of greater profits and better products. We'll be glad to work with you.

ATTAPULGUS Minerals & Chemicals Corporation

Dept. P, 210 West Washington Square, Phila. 5, Pa.

JUST OFF PRESS—the current issue of Attaclay Pesticide Digest, discussing various aspects of pesticide processing. Write for your copy, and future Digests as published.

AGRICULTURAL CHEMICALS

THIS MONTH'S COVER

Dr. Charles E. Palm, head, Department of Entomology, Cornell University, first president of the new Entomological Society of America, the amalgamated memberships of the old American Association of Economic Entomologists and the former Entomological Society of America. As the first president, Dr. Palm, with his executive committee, bears much of the responsibility of laying the framework of a forward-looking scientific organization to aid materially in the production of better crops through insect control.

JANUARY 1953

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AGRICULTURAL CHEMICALS

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Entered as second-class matter November 4, 1949, at the Post Office at Baltimore, Md., under the Act of March 3, 1879.

RAYMOND HIGH SIDE ROLLER MILL

WITH WHIZZER SEPARATOR

Specially equipped for SULPHUR GRINDING

THE principle of operation of the Raymond Roller Mill makes it a highly efficient unit for pulverizing sulphur and sulphur-bearing insecticides.

The slow speed of the Mill and the large air passages through the Whizzer Separator help prevent the sulphur from overheating or sticking. Special ball-bearing journals, designed for sulphur grinding, are used and the entire system is blanketed with inert CO_2 gas.

Electrically welded, heavy-gauge piping, pressure relief vents, and motor-operated double discharge valve at bottom of cyclone collector, assure a gas-tight system and clean, dustless operation.

Raymond Roller Mills with their ease of control, economy of operation and uniformity of product, are equally efficient for handling various insecticide materials and phosphate rock fertilizer.

Write for Raymond Bulletin No. 68 for description of Insecticide Mills

COMBUSTION ENGINEERING – SUPERHEATER, INC.

1314 NORTH BRANCH ST.
CHICAGO 22, ILLINOIS

Raymond
PULVERIZER DIVISION

SALES OFFICES IN PRINCIPAL CITIES

The toughest three-letter word in business

"But . . ."

The word a man uses when he starts by nodding yes and ends by saying no.

"But . . ."

The word on a Multiwall buyer's tongue just after he's said, "Well, as long as we order by specification, I guess one brand's as good as another . . ."

Executives who purchase more than 85 per cent of all Multiwalls have a big BUT there.

They testify* that there are many other considerations. Among the most important, the reputation of the manufacturer. They judge him by his record of reliability, his effort to meet delivery dates, his willingness to give a full measure of service.

We welcome the challenge of the toughest three-letter word in business. We believe the attention big buyers of Multiwalls pay to the *extra* factors—dependability, for instance—has a lot to do with their giving Union a greater proportion of their Multiwall business.

More so every day . . .

IT'S UNION FOR MULTIWALLS

TRADE MARK UNION

*August, 1951 research study.

UNION BAG & PAPER CORPORATION • NEW YORK: WOOLWORTH BUILDING • CHICAGO: DAILY NEWS BUILDING

Calmonite

AMMONIUM NITRATE-LIME

20.5% NITROGEN

2 FERTILIZERS IN 1
Contains 10.25% quick-acting *nitrate* nitrogen.
Contains 10.25% longer-lasting *ammonia* nitrogen.

GREEN PELLETS READY TO USE
Sized for flow and ease of application in broadcasting, top dressing, side dressing, and irrigation. Non acid-forming.

ECONOMICAL SOURCE OF N
At low cost, Calmonite furnishes Nitrogen in the 2 forms needed by all plants — for rapid, early vigorous growth and sustained development.

SUPPLIES CALCIUM, TOO
Contains 35% to 40% calcium carbonate, secondary plant-food essential to soil productivity and good crop yields.

NOW AVAILABLE, F.O.B.
Regular Atlantic and Gulf ports, in even-weight, 6-ply paper bags with 2 bituminous liners.

LOOK AT CALMONITE!
Write for a sample and for additional information today.

EXCLUSIVE DISTRIBUTORS FOR
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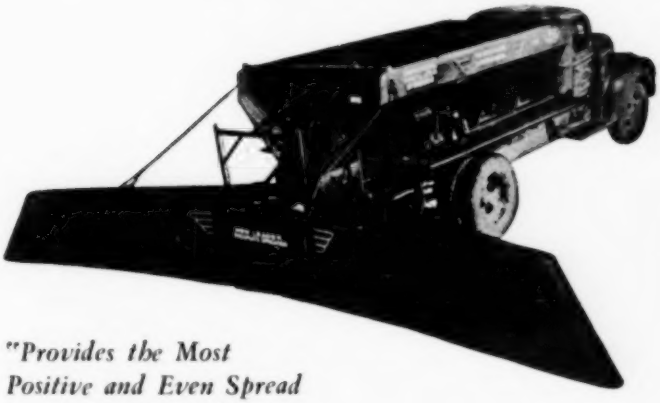
H. J. BAKER & BRO.

INCREASE YOUR SALES OF COMMERCIAL FERTILIZER AND LIMESTONE



"Provides the Most Positive and Even Spread on the Market today!"

by recommending the "New Leader" SPREADER for custom spreading

Right in your territory, there are men who can be induced to go into the business of custom spreading. Many dealers of commercial fertilizer and limestone are getting bigger sales volume through the aggressive promotion of the custom spreading idea.

URGE YOUR SALESMEN TO BE ON THE LOOKOUT FOR CUSTOM SPREADING PROSPECTS!

Every time you induce a man to buy a "New Leader" Spreader, you make a friend and a customer. He will promote the sale of commercial fertilizer and limestone and you will make a profit on the fertilizer which he buys from you.

"NEW LEADER" Scores 10 FIRSTS

1. The first successful truck mounted lime spreader that could handle stock-pile lime satisfactorily.
2. The first successful lime spreader with a chain conveyor.
3. The first lime spreader built with Twin Distributor Discs.
4. The first lime spreader with a successful center dump.
5. The first lime spreader with a back endgate swinging wide open.
6. The first lime spreader with running boards or catwalks as standard equipment.
7. The first lime spreader with a 24" wide conveyor trough.
8. The first spreader with an all-steel frame and wooden hopper.
9. The first lime spreader with a successful attachment for spreading bulk or sacked commercial fertilizer.
10. And now! The first commercial fertilizer spreader with distributor discs driven at a constant speed by a separate motor. Conveyor chain positively synchronized with speed of rear truck wheels, assuring full width spread at all times and uniform distribution.

"New Leader" Spreaders spread a minimum of 100 pounds per acre, to any maximum desired up to 4½ tons per acre. Send coupon for free literature and name of your local distributor.

The Complete "New Leader" Line INCLUDES

Bulkmaster
Limestone Spreader
Self-Unloading Bulk Transport
Tailgate Sand and Cinder Spreader
Hi-Way Material Spreader
Bulkmaster, Jr.
Comb. Commercial Fertilizer and Limestone Spreader
Feedmaster
Truck Mounted Sand And Cinder Spreader

Peninsular Spreading Service of Kissimmee, Florida purchased three 33-ft. New Leader Self-Unloading Bulk Transports and two New Leader Fertilizer Spreaders for spreading fertilizer on pastures and in citrus groves.

"New Leader" Self-Unloading Bulk Transport

This 20-ton transport with elevator in place is ready to load a "New Leader" Spreader Truck. Eliminates demurage on freight cars; gets fertilizer to the job quickly. Spreader trucks can stay in field as this is a complete self-unloading unit, leaving tractor free to return for another transport load. Unit divided into four 5-ton compartments. Each may be unloaded independently. Compartments and endgate removable for hauling bagged and packaged goods. Capacity 5 to 25 tons, 11 to 40 feet long.

HIGHWAY EQUIPMENT COMPANY, INC.

Manufacturers of the World's most complete line of Spreader and Bulk Equipment

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Send full information on:

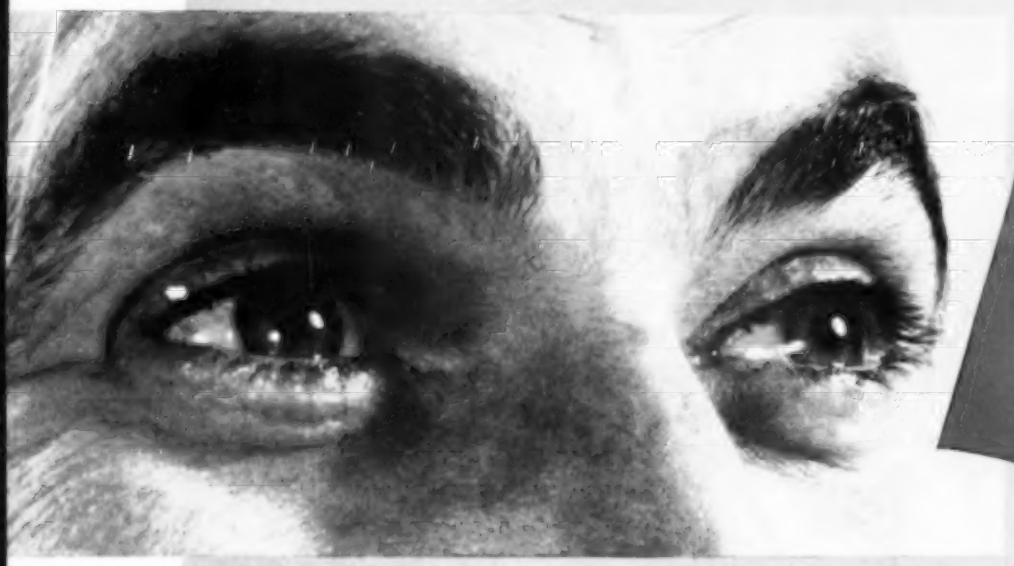
Spreader ..... Bulk Transport .....

Bulkmaster ..... Complete line .....

Name .....

Address .....

City ..... State .....



COLUMBIA-SOUTHERN

BHC

Benzene Hexachloride . . . for manufacturing use only

are you keeping your eyes on new developments in **BHC** and **CHLORO-IPC**?

COLUMBIA-SOUTHERN

CHLORO-IPC

Isopropyl N (3-Chlorophenyl) Carbamate . . . for manufacturing use only

ARE YOU CAPITALIZING ON THE USES FOR BHC?

The many uses already established for BHC, and further uses now under test, open vast new markets and profit opportunities to manufacturers of BHC dust or spray concentrates.

1. SPITTLEBUGS IN FIELD CROPS. Experiments have shown that in combating spittlebugs, BHC has increased the yield of field legumes. BHC's speed of kill reduces plant injury from bugs, leafhoppers and thrips. Early spring treatment is normally prescribed.

2. AMBROSIA BEETLES IN LOGS AND LUMBER. When these pests burrow under the bark, various stains frequently develop in the wood. Because of BHC's speed of kill, a promising market exists in uncut timber or cut logs. Spray treatment is normally recommended.

3. SPRAY FORMULATIONS. There is a steadily increasing use of liquid emulsifiable concencentrates which employ Columbia-Southern's 42% technical BHC for higher concentrations and greater stability.

4. NURSERIES. Experiments show great acceleration in the rate of sapling growth when BHC is added to the soil.

5. HIGH CONCENTRATE DUST BASES WITH HI-SIL. BHC permits dust bases as high as 36% gamma which afford great reductions in shipping and packaging costs. Hi-Sil, another Columbia-Southern product, is widely used in making 75% DDT.

6. ANIMAL ECTOPARASITES. Better control over cattle lice is made possible by both BHC dust and sprays which kill the eggs as well as the adult lice. The growing cattle market indicates a growing BHC market. Outstanding control has been shown for hog mange mite with BHC dust or sprays.

ARE YOU CAPITALIZING ON THESE USES FOR CHLORO-IPC?

Columbia-Southern pioneered in the development and field testing of Chloro-IPC and was first to serve agriculture with this promising herbicide ingredient. Chloro-IPC is the brand name of Columbia-Southern for Isopropyl N (3-Chlorophenyl) Carbamate.

1. COTTON Extensive experiments show that spray applications of Chloro-IPC can increase the yield of cotton while reducing by as much as 75% the labor of hoeing.

2. FIELD LEGUMES. Outstanding control has been reported in Middle Atlantic states through the application of 2 to 3 lbs. of Chloro-IPC in mid-winter on alfalfa plantings.

3. EXTENDING POTATO DORMANCY. In U.S. and abroad, Chloro-IPC applications show a highly significant extension of the dormant period in potatoes. Spring sprouting and shrivelling are retarded in stored table stocks.

4. VEGETABLES. Tests show promising results on certain leafy vegetables along the Eastern Seaboard in controlling a wide variety of annual weeds. As little as 1 pound per acre has proved effective under certain conditions.

5. SEED GRASSES. Fall treatments of Chloro-IPC for annual weeds in alta fescue show excellent promise, particularly in the Pacific Northwest.

6. NURSERIES. Chloro-IPC soil applications are reported to permit great increases in sapling growth. This opens a new market.

A copy of the 1952 summary giving results of field testing is available upon request. Additional information concerning field and crop residues also can be furnished.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY

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PYRAX ABB GIVES YOU DENSER CLOUDS, BETTER COVERAGE

Do you know why Pyrophyllite has become the fastest growing agricultural diluent in the last twelve years? . and why more Pyrax ABB is used than *all other Pyrophyllite?*

First, Pyrax ABB is extremely well adapted to aircraft dusting because it forms dense clouds that hug the crop no waste from drifting clouds that settle on adjoining fields.

Second, Pyrax ABB adheres electrostatically, even to the dry underside of foliage you can dust anytime without waiting for proper moisture conditions.

Third, because Pyrax ABB is nonhygroscopic and chemically inert (pH between 6.5 and 7.0), it will not affect the toxic strength of botanicals, DDT, benzene hexachloride, toxaphene, thiocarbamates, or the newer organic toxicants . . . therefore you can use *less* toxicant and *even store these dusts from season to season* without affecting their killing power.

If you need a free-flowing, non-absorptive, neutral, and nonhygroscopic agricultural dust diluent that is always in dependable supply, write today for *all* the reasons why you should be using Pyrax ABB.

R. T. VANDERBILT CO.

Specialties Department

230 Park Avenue **New York 17, N. Y.**

☐ Please send technical information on PYRAX ABB.

☐ Please send sample of PYRAX ABB.

NAME .....

POSITION .....

(Please attach to, or write on, your company letterhead)

OPEN THESE FOUR DOORS

to new profits, new markets in SOLUBLE FERTILIZERS

The fast-moving, fast-growing liquid fertilizer market's setting a pattern for profit that's hard to beat. *Now's* the time to move in this market.

Monsanto helps you by furnishing low-cost concentrated nutrients that are pure, soluble and easily compounded.

Moreover, you'll find that your customers will order and reorder soluble fertilizers because of these advantages:

Easy to apply— to use, just add water and apply with standard farm equipment.

Efficient to use —nutrient benefits are readily available to plant.

Versatile —use for leaf feeding, starter solutions, seed treatment or side dressing.

Simple to handle —concentrated form makes lightweight, compact shipments.

For more information, write MONSANTO CHEMICAL COMPANY, Phosphate Division, 1700 South Second Street, St. Louis, 4, Missouri.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle, Twin Cities. In Canada, Monsanto Canada Limited, Montreal.

MONSANTO PLANT NUTRIENT CHEMICALS

	N	P_2O_5	K_2O
Monopotassium Phosphate (Crystals)	—0—	51.6%	34.2%
Diammonium Phosphate (Crystals)	21.0%	53.85%	—0—
Monoammonium Phosphate (Crystals)	12.2%	61.61%	—0—
Phosphoric Acid (75.0%) (Liquid)	—0—	54.5%	—0—

MONSANTO CHEMICALS—PLASTICS

SERVING INDUSTRY — WHICH SERVES MANKIND

IMPROVE YOUR AGRICULTURAL FORMULATIONS WITH NEW *TRITON* EMULSIFIERS

Spontaneity and stability over a wide range of water hardness are the important characteristics of emulsifiable pesticides. TRITON X-150 or TRITON X-160 can give your formulations these properties. Pesticides containing these new emulsifiers will give top performance—whether used with the soft waters of the Delta Area or the extremely hard waters of the Pecos River Basin. TRITON X-150 and TRITON X-160 are *effective in low concentrations—economical* to use.

Typical Applications:

TRITON X-150—*for emulsifying Dieldrin, BHC and combinations of BHC and DDT*

TRITON X-160—*for emulsifying Toxaphene, Aldrin, Chlordane, and Chloro-IPC*

Blends of TRITON X-150 and TRITON X-160—*for emulsifying DDT; combinations of Toxaphene and DDT; Heptachlor; 2, 4-D esters and 2, 4, 5-T esters*

Write us for additional applications, technical information, and samples.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

TRITON is a trademark, Reg. U.S. Pat. Off. and in principal foreign countries.

now... LINDANE for.. SEED TREATMENT

One of the newest advances in pest control concerns LINDANE and its use for pest-proofing seeds during planting time. Initial seed treatment tests by experiment stations in Canada and the United States have been so promising that LINDANE is recommended for wider consideration.

Encouraging work has already been done with corn, wheat, oats, barley, rye, sugar beets, peas and beans. Seeds treated with LINDANE wettable powder (25% to 75% concentrations) kill or control wireworms, corn rootworms and seed corn maggots. To date, it is the most economical and effective seed treatment developed for controlling these destructive pests. Approximately one ounce of LINDANE per acre does the job.

Write for latest information about this new application for LINDANE which promises to be a boon to farmers everywhere.

DIAMOND ALKALI COMPANY

Organic Chemicals Division

80 LISTER AVE., NEWARK 5, N. J. • Plants: Newark, N. J. and Houston, Tex.

DIAMOND ALKALI CHEMICALS

Another Storage Problem Solved by Butler

Bolted Steel Tanks Designed Specifically for Rock Phosphate Storage

Now, for the first time, you can get special storage facilities made to order for commercial rock phosphate dealers. Butler Phosphate Tanks are built of heavy gage steel...specifically designed to contain the weight of phosphate. Rugged Butler Tanks give you weather-tight, fire-safe storage and can be easily moved to new locations. Bolted construction of Butler Tanks permits dismantling and re-erection with a minimum amount of labor and minimum loss of materials. Butler Phosphate Tanks are available in many sizes to meet your individual needs.

Do you have special storage problems?

More than half a century of steel fabrication has provided Butler with the engineering experience and construction skill to meet your requirements. Butler Bolted Steel Tanks provide dependable protection... permanent storage... for many liquid and dry commodities. Find out how Butler Tanks can supply the easy, low-cost answer to your storage needs.

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BUTLER STEEL PRODUCTS

OIL EQUIPMENT — STEEL BUILDINGS
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SPECIAL PRODUCTS

Write today for complete information on Butler Bolted Steel Tanks!

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Butler Phosphate Tank installation, T & O Rock Phosphate Co., Sedalia, Mo.

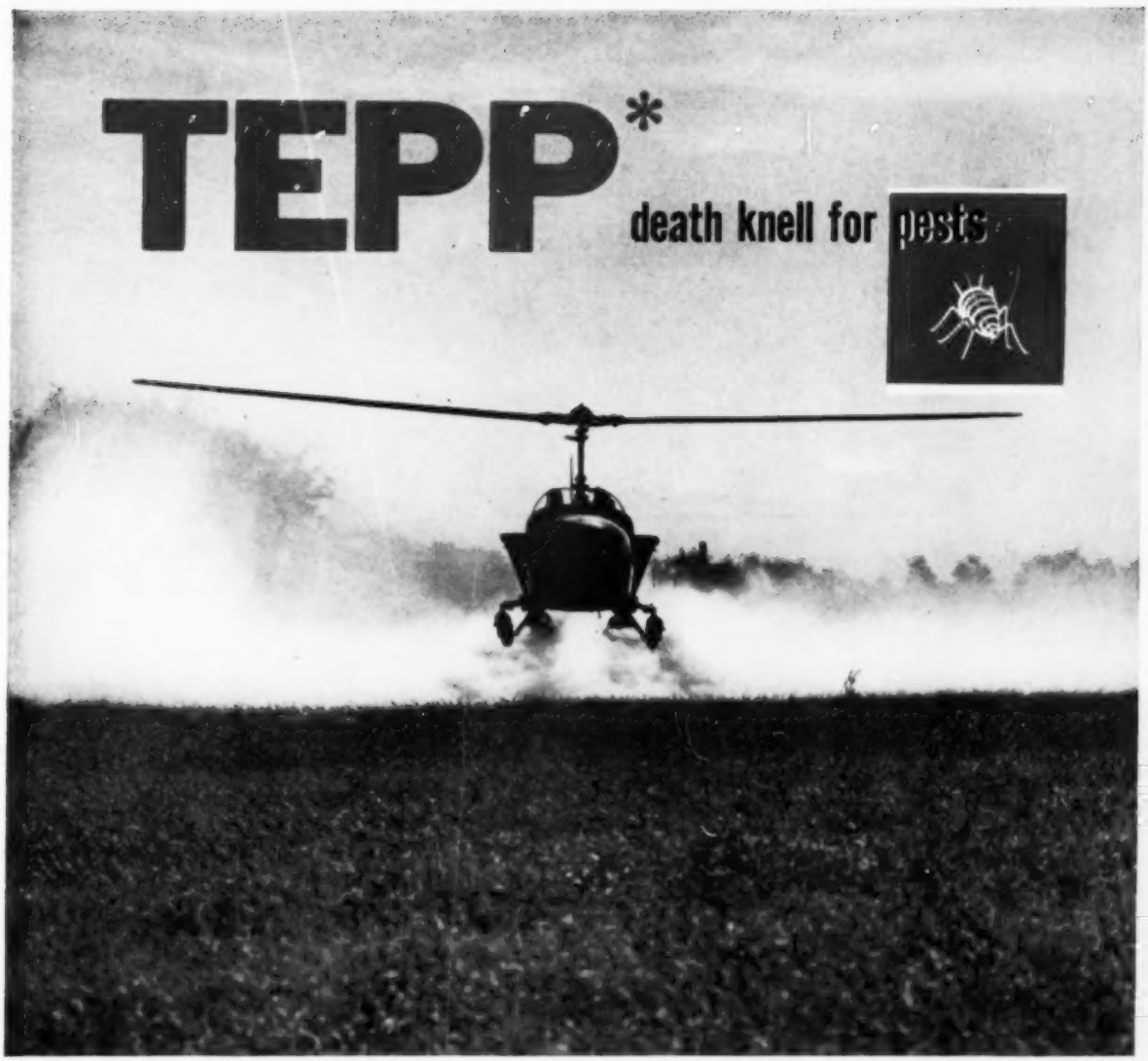
PROTECTION

built in

Like the turtle's hard, protective shell, **Fulton's W.P.P.L.** (Waterproof Paper Lined) **Bags** are the textile bag with the backbone to do the job of a far more expensive rigid container. They offer you an easy-to-handle, economical package with *built-in protection* — an inner lining of plastic or crinkled Kraft paper laminated with special adhesives to either burlap or cotton . . . safely, surely sealing in your product against the damaging effects of moisture or odors. For full details, write your nearest Fulton factory today!

Fulton BAG & COTTON MILLS

Atlanta • New Orleans • Dallas • St. Louis • Denver • Los Angeles • Kansas City, Kans. • Minneapolis • New York, 347 Madison Ave. Winter Haven, Fla. • San Francisco • Phoenix



Dust one day—harvest poison-free crops two days later!

Yes, amazing TEPP makes this possible. TEPP is swift and sure—a powerful killer that leaves no lingering poison residue. When handled according to recommended procedures, it is ideally suited to a quick bug clean-up. With this remarkable pest-control ingredient, growers can stop last-minute infestations which often make produce unfit for market. Processors and packers can now be assured of cleaner, higher quality crops.

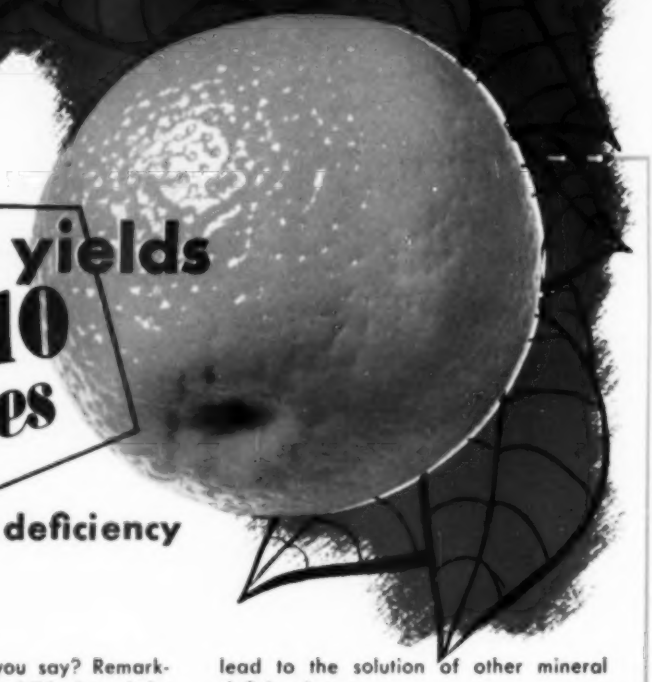
TEPP can be economically formulated 1) as a liquid concentrate, 2) as a stabilized dust, and 3) with other active ingredients. It is compatible with most other pesticides. Instructions for proper mixing and safe handling are available from manufacturers of TEPP.

For fewer rejects and consistently higher grade crops that need less washing, specify formulations containing TEPP. Ask your supplier for further information about this effective pest-destroyer. For the names of manufacturers of TEPP, write to Tennessee Eastman Company, Division of Eastman Kodak Company, Kingsport, Tennessee.

TEPP* ***means pest-free crops poison-free crops***

**Tetraethyl Pyrophosphate is made from triethyl phosphate—an EASTMAN chemical. TEPP is not made by Tennessee Eastman Company.*

SEQUESTRENE* NAFe



increases citrus yields 5 to 10 times

in severe cases of iron deficiency

Remarkable figures, you say? Remarkable even in this day of "Jack and the Beanstalk" yields?

We agree. And yet . . .

Mere mathematics fail to tell the whole story. Sequestrene NAFe does increase citrus yields 5 to 10 times but more than that this formulation makes a truly significant contribution to agriculture:

It corrects iron deficiency, a problem that has plagued farmers and scientists alike.

The correction of iron deficiency is the beginning, the opening wedge that may lead to the solution of other mineral deficiencies.

Combinations of Sequestrene and minerals such as zinc, copper, manganese and magnesium are now being applied on an experimental basis. Progress has been satisfactory.

There is much to do, much to learn. But the results to date, in the field of iron deficiency at least, are no longer merely "interesting"—they are, instead, making the hopes of the early research stand up under the exacting demands of actual field conditions.

Literature available on request: (1) technical bulletin on "Metal Complexes of Sequestrene in Plant Nutrition"; (2) pamphlet on "Iron Chlorosis in Citrus"; (3) paper by Ivan Stewart and C. D. Leonard on "Iron Chlorosis—Its Possible Causes and Control"; paper by Louis Jacobson on "Maintenance of Iron Supply in Nutrient Solutions by a Single Addition of Ferric Potassium Ethylenediamine Tetraacetate".

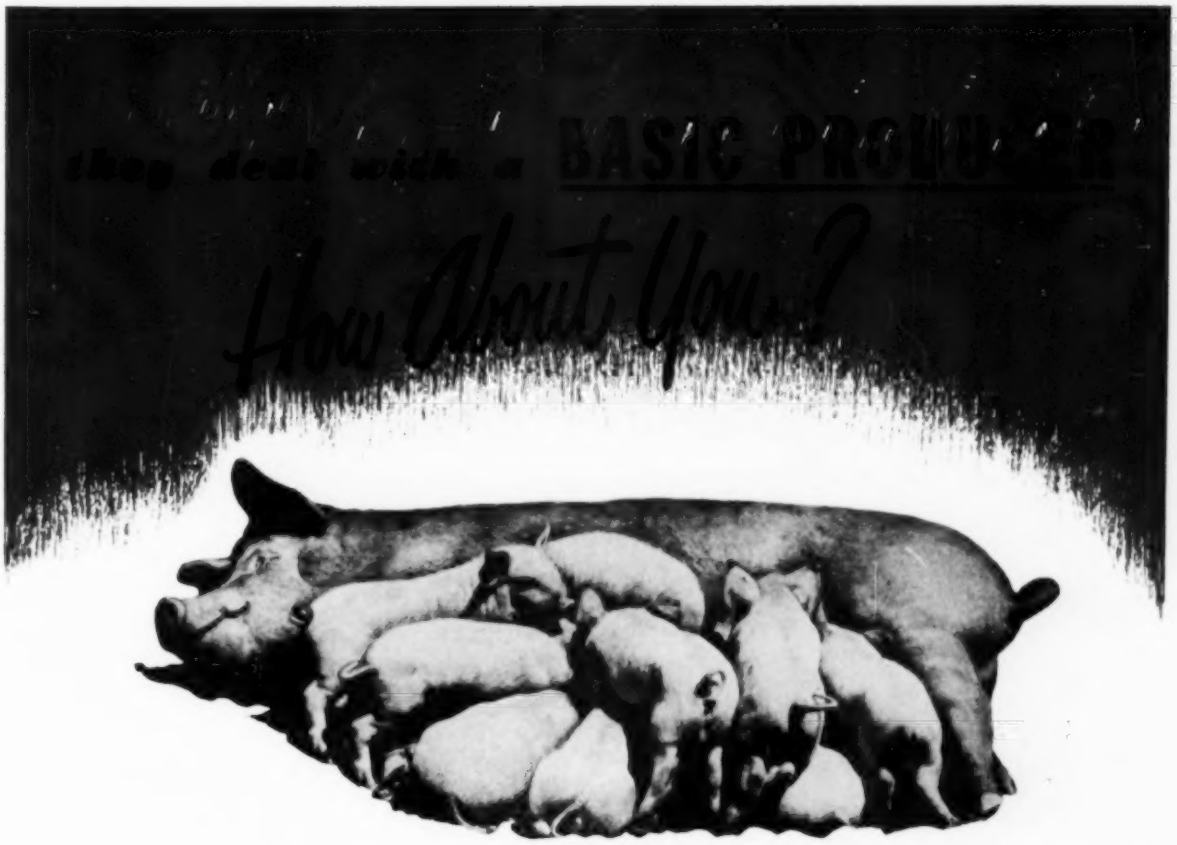
*"Sequestrene" is the registered trademark of the product of Alrose Chemical Co., a Geigy Company.

Geigy Company, Inc., Insecticide Division, are the exclusive sales agents for Sequestrene in the agricultural field.

ORIGINATORS OF Geigy DDT INSECTICIDES

GEIGY COMPANY, INC. 89 BARCLAY STREET N. Y. 8, N. Y.

Aberdeen, N. C.; Burlington, Iowa; Colorado Springs, Colo.; Elkton, Md.; Fresno, Calif.; Houlton, Me.; Leland, Miss.; McGregor, Tex.; Orlando, Fla.; Walla Walla, Wash.



More and more buyers of agricultural chemicals are finding out there are real advantages in dealing with a basic producer. Pennsalt customers, for example, know four good reasons:

1 They have complete confidence in the quality of the Pennsalt products they buy. They know they are made by one of the oldest, most respected chemical companies in the nation—a company with a rigid system of quality control for every product; a company with broad resources, modern equipment, experienced personnel.

2 They get prompt fulfillment of their orders from the very company that makes the product. Pennsalt, a nationwide organization, has established many of its producing plants within the areas they serve. As a result, buyers enjoy quick service, low freight rates.

3 They know they are buying *effective* chemicals, because every Pennsalt product is thoroughly tested at the famous Whitemarsh Research Laboratories, as well as in the field.

4 They are assured of a dependable supplier for the products they need—even through unusual economic conditions.

It's all summed up in the name PENNSALT—over a century old, and proudly applied to this line of top-quality, basic agricultural chemicals. It will pay *you* to know more about the Pennsalt line, too! For full details write to: Agricultural Chemicals Dept., Pennsylvania Salt Manufacturing Company, in Philadelphia 7, Pa.; Tacoma, Washington; Bryan, Texas; or Montgomery, Alabama.

Pennsalt Chemicals

Technical BHC
Technical DDT
Lindane
Sodium Chlorate
Emulsified Formulations
Forbam
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—and other products

TENNESSEE CORPORATION

MINERAL SALTS

One of the country's foremost producers of Agricultural Chemicals and Soluble Mineral Salts

COPPER SULPHATE

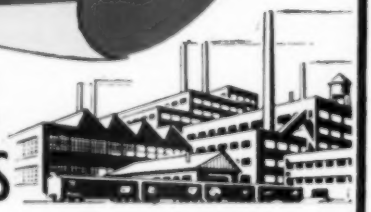
ZINC SULPHATE

MANGANESE SULPHATE

MAGNESIUM SULPHATE

BORON

FERRIC IRON SULPHATE



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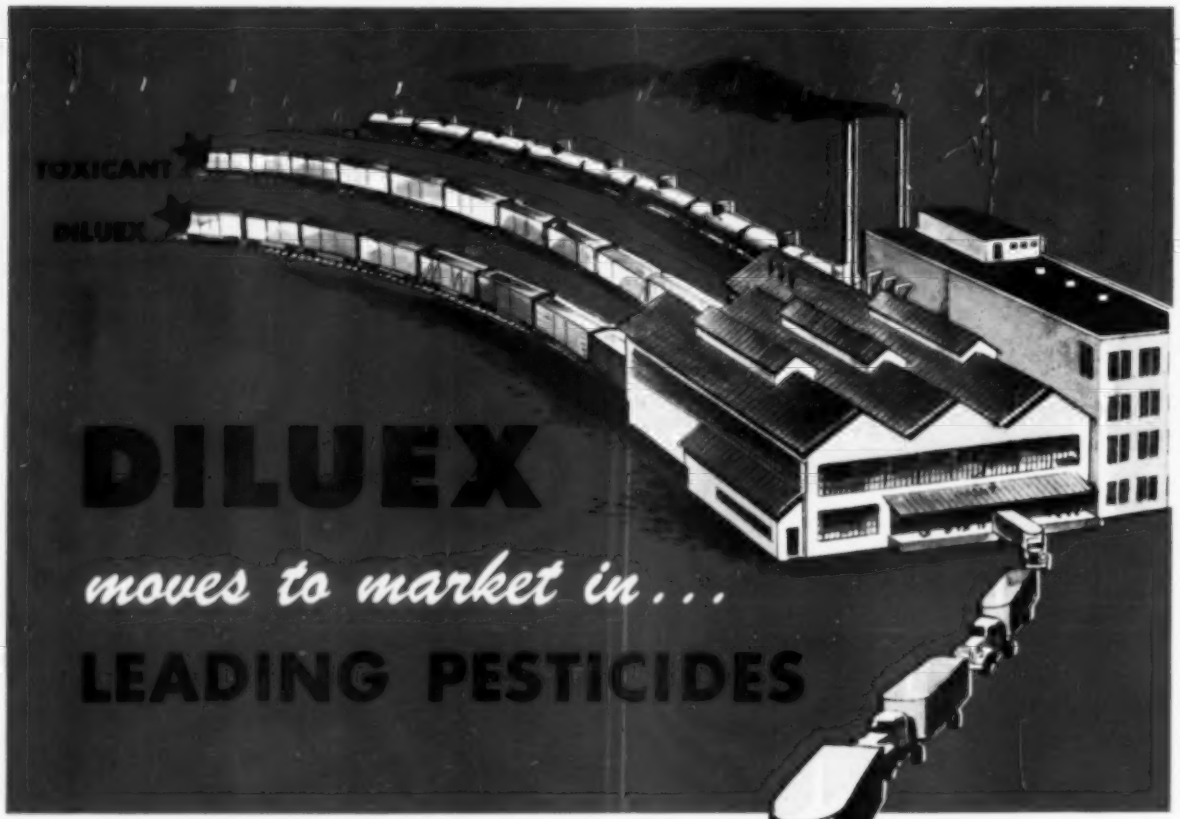

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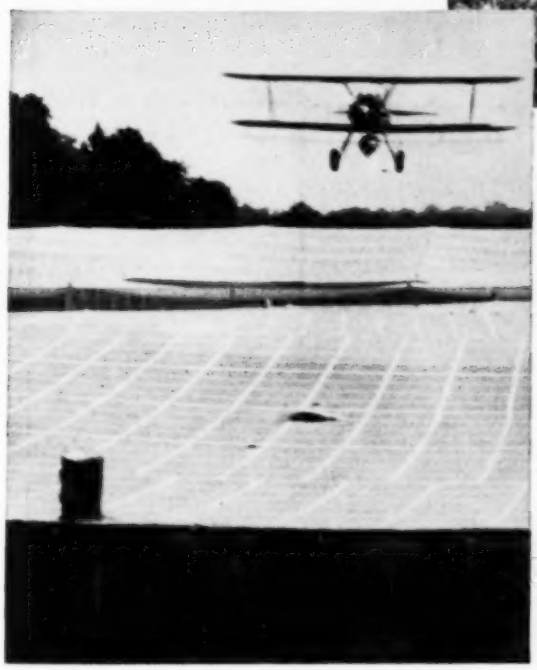

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THE EDITOR COMMENTS

SERIOUS setbacks in over all insect control during the coming season may result if the Food and Drug Administration fails soon to announce the residue tolerances which the trade has been expecting for many months now. With manufacturers uncertain about where they stand in the matter, there is bound to be reluctance on their part in making expenditures for developing new toxicants.

A few years ago, the slackening off of new materials would have made but little apparent difference, since at that time there seemed to be plenty of insecticides on tap.

Today's picture is quite different, however. With insects of many species showing increasing resistance to many of the pesticides now in use, there is a continuing need for new materials. Some entomologists have stated that they hardly know where to turn next in finding a solution to the perplexing problems of resistance. On some pests, none of the currently-used toxicants is doing a satisfactory job of control.

One answer is to increase the rate of application, but this is to risk leaving a greater residue. Is the amount of residue left under current recommendations already too much? How much more insecticide can be applied to certain crops before the residue becomes harmful? Will it be possible, with resistant insects on all sides, to prevent extensive damage to 1953 crops without some kind of an increase in control activities? How long will the insecticide manufacturing trade be left completely in the dark regarding how much pesticide residue will be allowed?

Hope is being expressed that the Food and Drug Administration will announce residue tolerances in time for use as bench marks in this season's pest control plans. Even though the tolerance figures may be difficult to achieve with adequate control, they would still represent a known quantity and something that could be either raised or lowered after the arguments on both sides are heard. But in the absence of any marks whatsoever, it is impossible for the pesticide trade to do any more than guess. And "guessing" is a hazardous business in a field as technical as this one is. Yet, what alternative do the manufacturers have? On one hand, they are expected to produce materials that will control insects, with the proviso that such control will not harm the ultimate consumers of crops so treated. At what point does "harm" begin? That's the question . . . and there is a tremendous difference of opinion on the answer.

Only F.D.A. can answer that, and we sincerely hope it will do so quickly. The findings from those thousands and thousands of words of testimony taken during the hearings 'way back in 1950 should certainly be ready to announce by now. Futher postponement will make such information too late for 1953's growing season. The need is immediate and urgent.

HOW will the current trend away from the farm affect the agricultural chemical sales volume in years to come? Although a slightly academic question, it is one that may come more and more into our thinking as time goes on. As farm populations diminish, will use of agricultural chemicals increase in proportion?

In the first place, why are people leaving agriculture for work in cities? The *New York Times Magazine* recently traced the activities of 700,000 G.I.'s given farm training after World War II, and reported that nearly half had given up farming entirely. The reason was mostly economic . . . the high cost of acquiring land for one thing. Other factors were the lack of pension plans and the confinement involved. One GI said he'd hardly had a day off in five years.

Thus the farm competes with industry and as the latter offers more and more attractive situations to the country's young people, the trend will probably continue. However, this makes imperative the greater use of agricultural chemicals to provide shortcuts. The trade should be encouraged at the general prospect.

Agricultural Chemicals and Flavor Evaluation

THE agricultural chemical industry is greatly concerned with the ever increasing requirements for registration and sale of new chemicals possessing fungicidal or herbicidal properties. Requirement of *adequate* off-flavor data for acceptance and use is but one step among many. This concern can become a nightmare if no definition of "adequate" is provided; when methods of determining off-flavor are so numerous and varied that none are accepted as valid; when the results of carelessly run flavor tests are published and accepted as fact; when the manufacturer is not permitted to examine samples which have been reported off-flavor, or when little or no consideration is given to the components, other than the insecticidal or fungicidal chemical which makes up a pesticide formulation as applied to crops.

Must the agricultural chemical industry give up now and be satisfied with present cost and performance of pesticides? Must research be grounded until insect resistance to present-day insecticides has developed? Can we expect the bumper crops we have enjoyed the past fifteen or more years to continue without sooner or later encountering reduced yields due to insect and disease attack supplemented by adverse weather conditions? Can we adequately feed an ever-increasing population with present methods of production including pest control? Must we learn to prefer the distasteful products of fermentation and molds in fruit and vegetables due to lack of pest control? Must we accept insect excrement with or without the presence of human disease organisms or viruses or off-flavor such as bitter rot in apples due to the presence of fungi or bacteria? Must we accept coarse fibered fruits and vegetables grown as the result of competition with weeds? Are we to lose sight of the normal variations in flavors that occur because of differences in soil, rainfall and sunlight or the personal preferences of individuals or nationalities?

I do not know the answers to all of these questions but I do know that members of the agricultural chemical industry at present are working under great handicaps and I use the term "working" advisedly. A considerable amount of off-flavor test work sponsored by agricultural chemical manufacturers is now in progress in several states. Much valuable data is being collected. Every effort is being made to cooperate with the National Canners Association and with those State and Federal authorities whose responsibility it is to make recommendations to farmers and orchardists for use of pesticides.

Abnormal Flavor Rare

IT is the feeling of our committee that off-flavor in fruits and vegetables attributable to the use of pesticides is of rare rather than a common occurrence; that off-flavor when encountered is associated with improper use of pesticides and that adequate directions for the use of pesticides will, in most cases, preclude off-flavor. To date, objectionable flavor has been directly attributable to a very small number of pesticidal chemicals. Residue tolerances, when announced, may reduce the problem to a workable status and agricultural chemicals that alter flavor can then be determined with reasonable screening.

Unless workable methods are made available for determining flavor changes in fruits and vegetables, the agricultural chemical industry is faced with another millstone around its neck. Present requirements for marketing a new pesticide are such that development costs are almost prohibitive. Even now there is little likelihood that in the United States new chemicals will be born of basic research. Most manufacturers can afford only to investigate possible rearrangement of molecules in compounds already discovered or depend on the chance of obtaining safer and more effective pesticides from foreign research.

Further Data Needed

HERE are enumerated some of the factors currently confusing to the agricultural chemical industry:

1. *What is off-flavor?* Off-flavor might be defined as any gross departure from the normal in a fruit or vegetable, fresh or cooked, canned or frozen, now or later which would

by
C. C. Compton

Julius Hyman Division,
Shell Chemical Corporation

Chairman, Committee on Flavor Evaluation, National Agricultural Chemicals Association

Paper presented at 64th Annual Meeting, American Association of Economic Entomologists, Philadelphia, December 16, 1952.

render it unacceptable to the average consumer. Admittedly, this is not a complete definition but it serves to illustrate a point. "Departure from the normal" would require definition but variations in taste between varieties of fruits and vegetables, variations in taste of fruits and vegetables grown in different sections of the country and year to year variations in fruits and vegetables grown in any section of the country are recognized. Potatoes grown in New England, Florida or Idaho have certain taste characteristics. Apples, citrus fruits and many others are noted for variations in taste. Pesticides can hardly be held responsible for variations less than the normal unless sunlight, rainfall and methods of cultivation are to be controlled.

A definition of off-flavor is urgently needed in order that factual interpretation of existing data can be made.

2. *Methods of taste-testing.* In the past two or three years, literally dozens of methods for running taste tests have been in operation. On the one hand we have testings where potatoes are boiled in a beaker, in a laboratory reeking with pronounced odors and the stenographic force is called in to do the tasting. Then we have the more recent taste testing procedures where small, trained and screened panels employ the triangular tests which yield data that can be analyzed statistically for significance. Too many times in the past, the results of the first method outlined above have been given equal weight with tests run scientifically. Even with the latter method, too much importance has sometimes been given to the rank of the several chemicals under test and not enough to the statistical analysis of the data. We are concerned with off-flavor due to the use of a pesticide, not with normal variations that will always occur.

3. *Unrelated factors that result in off-flavors.* There are many factors contributing to changes in flavor particularly in small plot set-ups. Time will permit mentioning only a few.

We have referred to differences in soil, cultivation practices, rainfall and other climatic phenomena. Date of planting and other factors that influence maturity are important. For example. In small plot work, plants treated with pesticides will often produce a higher yield of quality fruit which may delay or hasten maturity a few days. If harvested at the same time as the check or control, the treated plot will yield fruit either unripe or over-ripe and comparisons cannot be made that will show the true effect of the pesticide under test. For this reason, the better operated taste testing set-ups now rely on horticulturists to determine the optimum harvest dates for both the treated plots and the check. Mention of small plots is made here because in carefully controlled applications of pesticides for off-flavor studies, small plots are a necessity. Due consideration should be given to the fact that in farmer operations the entire crop is treated and harvested when ready for the market.

In experimental work as conducted at the present time, a series of pesticides are often applied at uniform rates of application. This in spite of the fact that one pesticide under actual use conditions may be applied at a very low acre application rate, while another may require an acre application rate five, ten or more times as great to achieve comparable pest control. In almost every instance the high rate of application for the least efficient pesticide is employed. In this way a pesticide applied at a gross over-dosage rate may be penalized unless due consideration is given to the fact that such a pesticide has been applied to 5 to 10 times its effective rate of application.

4. *Incomplete reports on off-flavor studies.* Off-flavor studies are of comparatively recent inception and there has been little or no backlog of information to serve as a guide where pesticides are involved. True, professional and semi-professional taste panels have long been in operation, not only for the purpose of detecting off-flavor, but for the purpose of measuring consumer acceptance for coffee, wines and many canned products.

Entomologists have shown growing concern over the possibility of off-flavors from the use of pesticides. They have had no place to go to obtain evaluation data, so they ran some tests on their own. In some cases entomologists were able to obtain the assistance of scientists qualified to make organoleptic studies.

Early reports on this work left much to be desired. There are numerous statements in entomological and horticultural publications that simply note the presence or absence of off-flavor where one or more pesticides were under test. A table may be given showing the taste ranking of several pesticides. Where off-flavor is recorded, no mention is made of the factors other than the pesticide that may have contributed to off-flavor. For example, instances have occurred where off-flavor of fruits or vegetables has been recorded and where there was reason to question that the pesticide was the causative agent.

Subsequent investigation revealed that the maturity of the fruit or vegetable was delayed or hastened as compared to the check. Questioning the taste testers and re-examining the data, uncovered information that proved the product under test was rated off-flavor from causes unrelated to the pesticides used. Nevertheless the off-flavor report remains in print as a black mark against a product. No one can criticize the people whose responsibility it is to accept

(*Turn to Page* 121)

Systemics and Other Chemical Control Methods Discussed at

Cotton Insect Control

PROBLEMS in connection with the control of cotton insects, promising new cotton insecticides, the changing picture in cotton insect pests and new recommended control measures for the coming season all came in for discussion at the sixth annual Cotton Insect Control Conference held at the Peabody Hotel, Memphis, Tenn., December 10 and 11. The meeting, sponsored by the National Cotton Council of America, was attended by some eight hundred representatives of insecticide suppliers, cotton farmers and government representatives, who voted before the meeting adjourned to hold another conference at Memphis next year.

Chief on the list of problems this year was the subject of the toxicity hazard in connection with pesticide use. The group were told, however, that there has been no increase in the incidence of disease since modern cotton poisons came into use. They were advised also that what is needed for increased safety in connection with their operations is more education rather than new laws.

Below: (L to R) At Cotton Insect Control Conference, Left to right: K. P. Ewing, head of pink bollworm research B. E. P. Q., Waco, Texas; Dr. F. C. Bishopp, assistant chief, B. E. P. Q., Washington, D. C.; Avery S. Hoyt, chief, B. E. P. Q., Washington, D. C.; and R. W. Harned, in charge, cotton insect investigations, B.E.P.Q., Washington, D. C.

The pink bollworm was cited as a cotton pest which is rapidly increasing in importance. So menacing is the threat posed by this pest, and so great the damage it is now causing to cotton, that a full morning's program was given to this one subject.

As for the changing arsenal of control materials for the coming season, reports were heard on several promising new materials. Heading this list is endrin, which, it was indicated, offers considerable promise as a cotton insecticide due to its high toxicity to a wide variety of cotton insects. The new systemic insecticide, Systox, was also described as offering considerable promise for the control of red spider mites. Nevertheless recommendations of control materials for use during the coming season were changed but little from this

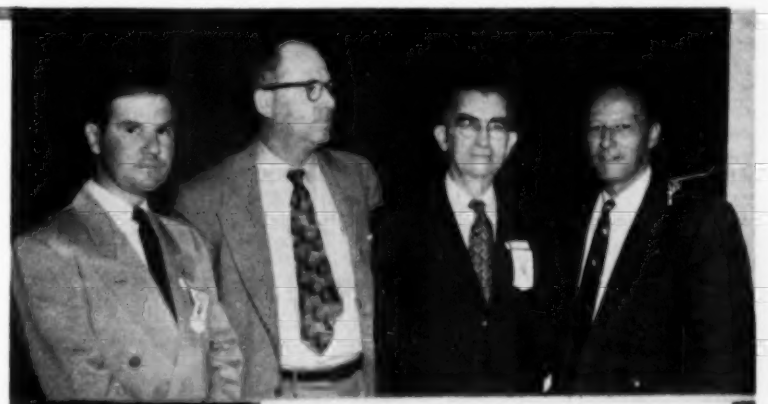
Meeting

In The Photos:

Top Photo: Four who appeared on program: A. N. White, extension entomologist, lower Rio Grande Valley, Weslaco, Texas; C. N. Spencer, Dallas, educational director, Texas Cottonseed Crushers Assn.; Avery S. Hoyt, chief, B.E.P.Q., Washington, D. C.; and Dr. W. J. Johnston, head, research development, production and marketing division, National Cotton Council, Memphis.

Middle picture: panel which discussed "Problems—Real and Imaginary": front row: Harvey Bales, Glendale, Glendale, Ariz; director, Natl. Insecticide Association: Dr. George C. Decker, Illinois State Natural History Survey, Urbana, Ill.; Dr. Gray Miley, manager, the Panther Burns Co., Leland, Miss.; and W. A. Ruffin, entomologist, Alabama Extension Service, Auburn. Back row: Clyde Bower, entomologist, State Board of Agriculture, Oklahoma City, Okla; L. A. Carruth, head, department of entomology, U. of Arizona, Tucson.

Lower Photo: (Front row) Messrs. S. L. Calhoun, W. A. Ruffin and C. R. Jordan. (Back row) C. A. King, Gordon Barnes and Dr. Kennedy.



year's materials. Though some of the newly introduced insecticides seem to promise to be effective and will undergo further tests, in all probability at least for the coming season the principal materials which will be of commercial importance will continue to be the same list used this year, with DDT, BHC, and Toxaphene most prominent.

Broad Scope of Topics

THE conference considered the toxicity problem at length at its opening morning session on December 10. —Current federal laws and regulations relating to pesticides provide ample protection to the public and there is no need for additional regulatory legislation such as now is being proposed, Dr. F. C. Bishopp, assistant chief, Bureau of Entomology and Plant Quarantine stressed emphatically in his talk, "Issues Involved in Pesticide Legislation."

"Throwing additional impediments in the way of registering and marketing pesticides will," he said, "retard research and the development of new products, increase the cost to farmers of those materials that are marketed, and lead to conflicting responsibilities and increased costs to government."

According to Dr. Bishopp, "not a single authentic case of illness or death due to insecticide residues has occurred."

"There are without doubt,"

(*Turn to Page 103*)

1953 RECOMMENDATIONS

INSECTICIDES that show promise for commercial use and were recommended for large scale field trials during the 1953 season are listed in the following article. This material is composed of preliminary excerpts taken from the conference report presented at the Cotton Insect Control Conference, Memphis, Tenn., December 7-9. These excerpts represent some of the significant changes or additions to the Conference Report of last year's meeting.

Endrin

Endrin (Compound 269) was used as a spray in large-scale field tests for cotton-insect control in many locations throughout the Cotton Belt in 1952. It is effective against the boll weevil when applied at the rate of 0.2 to 0.5 pound per acre; against thrips, the cotton fleahopper, and lygus bugs at 0.1 pound per acre; and against the cotton leafworm at 0.2 pound per acre. Endrin did not control spider mites, aphids, or the pink bollworm.

Endrin is toxic by skin absorption, by inhalation and by ingestion. It is recommended for use on cotton only where persons applying it are fully aware of the hazards involved and will follow the precautions prescribed by the manufacturers.

EPN

EPN was used experimentally for cotton-insect control in many locations throughout the Cotton Belt in 1952. It is effective against the boll weevil when applied at a rate of 0.5 to 0.75 pound per acre; against the yellow-striped armyworm at 0.3 pound per acre; and against thrips, the cotton fleahopper, the cotton leafworm, and some species of spider mites at 0.25 pound per acre. Aphids and bollworms may build up to damaging numbers after its use, but spider mites do not.

A mixture of EPN and DDT was more effective against the pink bollworm than DDT alone. EPN at the rate of 1 pound per acre showed promise for pink bollworm control.

Although somewhat less poisonous than parathion to warm-blooded animals, it is nevertheless high in relation to most poisons used in cotton-insect control. Therefore, it should be handled with extreme caution.

Isodrin (Compound 711)

In South Carolina isodrin gave effective control of the boll weevil at 0.2 pound per acre, both as a dust and as an emulsion spray. At this dosage it ranked first in six out of seven field-plot experiments against this insect.

In Texas isodrin gave initial kill of thrips and the cotton fleahopper when applied at 0.1 pound per acre and against the cotton leafworm at 0.3 pound in limited field tests.

When mixed with DDT it usually caused an increase in aphids and spider mites; however, this was not as pronounced with isodrin-DDT as compared to most of the recommended boll weevil-bollworm insecticide formulations. It usually did not cause an increase in these pests when used alone.

Isodrin was not effective against the bollworm, fall armyworm, yellow-striped armyworm, aphids, and spider mites.

Isodrin is toxic by skin absorption, by inhalation and by ingestion. It is recommended for use on cotton only where persons applying it are fully aware of the hazards involved and will follow the precautions prescribed by the manufacturers.

Methyl Parathion (Methyl ester of parathion)

This compound was widely tested during 1952 and continues to appear promising against the boll weevil at dosages between 0.25 and 0.5 pound of the technical material per acre, but at the lower strength results have not been consistent. Within this range, it would be highly effective against the cotton aphid, spider mites and the cotton leafworm. It is not effective against the bollworm.

Methyl parathion is an extremely dangerous poison. It is recommended for restricted use in some states where qualified personnel are in a position to assume full responsibility and to enforce proper precautions as prescribed by the manufacturers.

Malathon

This compound appears promising for the control of spider mites and the cotton aphid with dosages of 0.25 to 0.5 pound of the technical material per acre.

"Strobane" (B. F. Goodrich Insecticide 3960-X14)

This material, which is a mixture of chlorinated terpene isomers, having approximately 65 percent chlorine was considerably less effective than toxaphene against the boll weevil and the cotton leafworm in field cage tests. The amounts of active ingredient per acre required to cause mortalities of 50 percent against the boll weevil were 1.05 and 2.05 respectively, for toxaphene and Strobane; against the cotton leafworm, these amounts were 0.84 and 1.04, respectively.

Strobane is of about the same order of toxicity to warm-blooded animals as toxaphene and should be handled with care.

"Chlorthion" (Compound 22/190)

A phosphoric acid ester related to parathion containing chlorine.

This phosphorus compound is reported to be relatively nontoxic to warm-blooded animals. It was tested against the boll weevil, the bollworm, the cotton aphid, and spider mites in laboratory and field cages and in field plots during 1952. It appears promising for control of the boll weevil at dosages ranging from 0.25 to 0.75 pound of the technical material per acre. At this dosage, aphid control would be highly satisfactory and the build-up of damaging spider mite infestations would likely be prevented. It is not effective against the bollworm at these dosages and should be formulated with DDT when used for overall cotton insect control.

"Ovotran"

This material will effectively control all species of spider mites when applied at the rate of 2-3 pounds of technical material per acre, thorough treatment and contact of the mites is essential for good control. Its action is somewhat slower than aramite. Where immediate "knock-down" of mites is essential, the addition of parathion or TEPP to ovotran should be considered.

Cotton Insects

Boll Weevil. Variations in the effectiveness of insecticides approved for boll weevil control have been observed in local areas across the Cotton Belt. The choice of insecticides will be determined by their effectiveness in the particular area where the insect is to be controlled. Insecticides that have effectively controlled the boll weevil in one or more areas are tabulated in table I.

However, when these insecticides are used for late-season boll weevil control, other insect problems have to be considered. Infestations of the cotton aphid, the bollworm, and/or spider mites may develop when some of these insecticides are used alone. The bollworm and the tobacco budworm are the principal insects to be reckoned with in this category, and because of the danger of their rapid build-up, DDT should always be formulated with aldrin, BHC, chlordane, dieldrin, and heptachlor. (For rates see under the respective insecticides.) Calcium arsenate and toxaphene will sometimes control bollworms without the addition of DDT, but when they are used alone during the late season, careful check at 3- to-5 day intervals should be made to deter-

COTTON INSECT CONTROL

mine the presence of these insects. If their numbers are found to be increasing, DDT should be included in subsequent applications or separate applications of DDT alone should be made.

Aphids may build up rapidly after the use of calcium arsenate or DDT, or aldrin, chlordane, dieldrin, heptachlor, and toxaphene when formulated with DDT. Spider mites may build up rapidly after the use of aldrin, BHC, chlordane, dieldrin, heptachlor, or toxaphene either when used alone or with DDT. Careful checks at 5 to 7-day intervals should be made to determine the presence of these pests, and if found to be increasing, appropriate control measures (see section under "Aphids" and "Spider Mites") should be started at once.

Insecticides should be applied for boll weevil control when definite need is indicated. Except where early season control measures are practiced, insecticides should be applied at intervals of 4 to 5 days until the infestation is brought under control. Fields should be inspected weekly thereafter and applications made when necessary.

Bollworms. The bollworm, *Heliothis armigera* (Hbn.) and the tobacco budworm, *H. virescens* (F.), are the common bollworms attacking cotton. The tobacco budworm is the predominant species in many collections of bollworms from cotton, particularly in the eastern part of the Cotton Belt. Several other species of lepidopterous larvae that also cause boll injury sometimes are discussed elsewhere.

It is a difficult task to control bollworms sometimes and many erratic results have been reported.

Effective bollworm control depends on the thorough and timely use of properly formulated insecticides. Frequent field inspections to determine the presence of eggs and young larvae during the main fruiting period of cotton in any given field are essential. It is too late for effective control after the larvae have already entered the squares and bolls.

The most effective insecticide for bollworm control is DDT. For heavy bollworm infestations it should be applied at the rate of 1.0 to 1.5 pounds of the technical material per acre in a 10 per cent dust or concentrated spray. DDT may be used in mixtures with other insecticides where other insects as well as bollworms require control. It is compatible with lime-free calcium arsenate, but not with regular calcium arsenate. Bollworms usually are controlled where 0.5 pound or more DDT per acre is applied with BHC, aldrin, dieldrin, or heptachlor in the regular schedule for boll weevil control.

Toxaphene, at the rate of 2 to 4 pounds per acre, is the next most effective insecticide against bollworms. This may be applied as a 20 per cent dust or as a spray. The addition of DDT to toxaphene dust or spray greatly improves the effectiveness of this insecticide for bollworm control.

Calcium arsenate and cryolite dusts are less effective.

In areas where spider mites are a problem, dust mixtures containing organic insecticides used for the control of bollworms should include 40 per cent of sulfur or an appropriate amount of some other suitable miticide.

Cotton Aphid. Heavy infestations of the cotton aphid, *Aphis gossypii* Glov., often occur on cotton following the use of certain insecticides. Infestations also may be severe on seedling cotton where no insecticides have been applied.

The following treatments, when used in the boll weevil area will usually prevent an aphid build-up:

1. A mixture containing 3 per cent of the gamma isomer of benzene hexachloride and 5 per cent DDT in every application at the rate of 10 to 20 pounds per acre.
2. A mixture containing 3 per cent of the gamma isomer of benzene hexachloride and 5 per cent of DDT at the rate of 10 to 12 pounds per acre in alternate applications with calcium arsenate.
3. Nicotine 2 per cent in regular calcium arsenate at the rate of 10 to 20 pounds per acre alternated with calcium arsenate alone.
4. Parathion 1 per cent in lime-free calcium arsenate dust, or 1 per cent in dust or 0.1 pound per acre in spray added to aldrin plus DDT, dieldrin plus DDT, heptachlor plus DDT, or toxaphene plus DDT will effectively control the cotton aphid when any of these mixtures are used at the recommended rate for boll weevil control. However, parathion should be used only by those who are qualified to handle dangerous materials.
5. Toxaphene at the rate of 2 to 3 pounds of the technical material per acre in every application (where toxaphene is not formulated with DDT).

When heavy infestations of the cotton aphid occur and the need for rapid kill is indicated, the following treatments are effective. Heavy reinfestations are likely to recur in some areas in about 2 weeks following the use of BHC, parathion, and TEPP.

1. Benzene hexachloride applied to give 0.5 pound of the gamma isomer or an equivalent amount of lindane per acre.
2. Parathion applied either as a dust or spray at a rate of 0.1 to 0.25 pound per acre of technical material.
3. Nicotine 3 per cent in hydrated lime applied at the rate of 10 to 15 pounds per acre.
4. Forty per cent tetraethyl pyrophosphate applied at the rate of one-half pint, or its equivalent, per acre. The effectiveness of this material is of short duration.
5. Systox applied as a spray at a rate of 0.25 to 0.5 pound per acre.

Spider Mites. Spider mites have become increasingly important pests of cotton. The use of organic insecticides for cotton insect control has been a major factor in the changing importance of these pests.

Species known to attack cotton in the United States are the two-spotted spider mite, *Tetranychus bimaculatus* Harvey; Atlantic spider mite, *T. atlanticus* McG.; Pacific spider mite, *T. pacificus* McG.; the desert spider mite *T. desertorum* Banks; the tumid spider mite, *T.*

(*Turn to Page 117*)

TABLE I

Insecticide	Type of Application	Pounds of Active Ingredient per Acre
Aldrin	Spray or dust	0.25 to 0.75
BHC (gamma isomer)	Spray or dust	0.3 to 0.45
Calcium arsenate	Dust	7 to 10
Chlordane	Spray or dust	1 to 1.5
Dieldrin	Spray or dust	0.15 to 0.5
Heptachlor	Spray or dust	0.25 to 0.75
Toxaphene	Spray or dust	2 to 3

Higher Analysis Mixed Fertilizers as a factor in more efficient

Use of Plant Nutrients[1]

MORE efficient use of fertilizer and lime to accomplish a three-fold objective is the goal of a program recently announced jointly by the Secretary of Agriculture and the chairman of the executive committee of the Association of Land-Grant Colleges and Universities (16).[2] The program is expected to result in building up productivity of the Nation's farm land; increasing net returns to farmers; and increasing food and fiber production.

As pointed out in the program, attainment of these goals will require a joint, coordinated effort on the part of Federal and State agencies in cooperation with the fertilizer and lime industries and other public and private organizations. The importance of the program is emphasized by the fact that the prospective supply of primary plant nutrients—nitrogen (N), available phosphoric oxide (P_2O_5), and potash (K_2O)—in commercial fertilizers for domestic use in 1954-55 is more than 50 percent greater that the consumption of such nutrients in 1950-51.[3]

It is estimated (9) that the Nation's farmers spent some 880 million dollars for commercial fertilizers in the calendar year 1951. The expenditure in 1955 promises to exceed 1,300 million dollars. As one phase of the problem of increasing net returns to farmers from the use of fertilizers, it has long been recognized (*4, 5, 8, 12, 14*) that large savings in the annual expenditures for plant nutrients can be effected by increasing the concentration of nutrients in the materials and mixtures. Such savings result from lower costs per unit of nutrients for transportation, bagging, handling, and other expenses, including processing costs of the mixtures and certain materials, as the nutrient concentration of the fertilizers is increased.

The purpose of this paper is to indicate the extent to which the concentration of primary nutrients in mixed fertilizers can be increased and the possible financial saving resulting therefrom, particularly in relation to the supply of materials and nutrients anticipated for 1954-55.

Past Use, Future Goal

AS shown in Table I, the supply goal for primary nutrients in the year 1954-55 is 7,855,000 tons (11). This compares with a consumption of 4,728,200 tons in 1950-51 (*13*) and represents percentage increases of approximately 66 in total nutrients and 76, 65, and 58 in N, P_2O_5, and K_2O, respectively. It is interesting to note that relative to the total consumption of primary nutrients in 1950-51, the increase in the expected annual supply in the subsequent 4 years to 1954-55 is approximately equal to the increase in annual consumption that occurred in the 13 years to 1950-51. The comparable periods for N, P_2O_5, and K_2O are 16, 14, and 8 years, respectively.

Table I. - Consumption of primary nutrients in 1950-51 and supply goal for 1954-55

Nutrient	Consumption 1950-51	Supply goal 1954-55	Increase	
			Quantity	Proportion
	Tons	Tons	Tons	Percent
N	1,238,200	2,185,000	946,800	76.5
Available P_2O_5	2,110,100	3,485,000	1,374,900	65.2
K_2O	1,379,800	2,185,000	805,200	58.3
Total	4,728,200 (a)	7,855,000	3,126,900	66.1

(a). Differs from the sum of the individual figures because of rounding.

[1] Presented in part at the Sixth Annual Convention of the Association of American Fertilizer Control Officials, Washington, D.C., October 3, 1952.

[2] Italic numerals in parentheses refer to "Literature Cited" at end of paper.

[3] Except as indicated otherwise, the years referred to are those ended June 30, the tons are short tons, and the data are for the United States and possessions.

By

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Primary Nutrients in Mixed Fertilizers

FIGURE 1 shows the concentration of primary nutrients in the mixed fertilizers consumed in 1933-34 and 1938-39 to 1950-51, with projections to 1954-55 under premises indicated in a subsequent section. The concentration increased gradually from 18.3 percent in 1933-34 to 21.4 percent in 1946-47 and then more rapidly to 24.2 percent in 1950-51. As would be expected, the concentration has varied considerably among the different States and regions. Thus in 1950-51 it ranged from 19.81 percent in Georgia to 43.12 percent in North Dakota (*13*). Regionally the range was from 20.84 percent in the South Atlantic States to 29.70 in the Mountain States (Table II).

The State and regional variations reflect differences in (1) cropping practices, (2) recommendations of State agricultural authorities as to grades and types of mixed fertilizers, (3) State laws and regulations governing the registration and sale of fertilizers, (4) effectiveness of programs to acquaint the farmer with the economic advantages of higher analysis mixtures, (5) willingness and ability of fertilizer manufacturers to upgrade their products, (6) adequacy of supplies of high-analysis and concentrated fertilizer materials, and (7) location of mixing plants with respect to sources of fertilizer materials

Table II. -- Regional consumption of primary nutrients as mixed fertilizers in 1950-51 (a)

Region	Mixed fertilizers	Nutrient content (b)	
		Quantity	Proportion (c)
	Tons	Tons	Percent
New England (d)	345,300	95,550	27.67
Middle Atlantic (e)	1,567,100	384,450	24.54
South Atlantic (f)	4,841,000	1,008,650	20.84
East North Central (g)	2,967,700	839,690	28.30
West North Central (h)	884,600	261,910	29.61
East South Central (i)	1,963,100	428,640	21.85
West South Central (j)	736,900	174,550	23.68
Mountain (k)	61,500	18,280	29.70
Pacific (l)	273,200	73,900	26.90
Possessions (m)	337,400	95,880	28.41
Total	13,977,800	3,381,100	24.19 (n)

(a). Data from Scholl and Wallace (*13*).
(b). N, available P_2O_5 and K_2O.
(c). Weighted average.
(d). Maine, N. H., Vt., Mass., R. I., Conn.
(e). N. Y., N. J., Pa., Del., D. C., Md., W. Va.
(f). Va., N. C., S. C., Ga., Fla.
(g). Ohio, Ind., Ill., Mich., Wis.
(h). Minn., Iowa, Mo., N. Dak., S. Dak., Nebr., Kans.
(i). Ky., Tenn., Ala., Miss.
(j). Ark., La., Okla., Tex.
(k). Mont., Idaho, Wyo., Colo., N. Mex., Ariz., Utah, Nev.
(l). Wash., Oreg., Calif.
(m). Hawaii, Puerto Rico, Alaska.
(n). The weighted average grade was 4.18-11.03-8.98.

Table III. - Percentages of miscellaneous materials used in mixed fertilizers in certain calendar years of the period 1920 to 1950 (a)

Type	1920	1930	1941	1947	1950
Materials supplying secondary and trace nutrients (b)	0.2	2.1	7.4	7.8	8.5
Organic conditioning agents	1.5	1.4	1.4	1.7	2.1
Other materials (c)	12.2	10.8	10.9	8.5	9.0
Total	13.9	14.3	19.7	18.0	19.6 (d)

(a). The data for 1920 to 1947 are from Mehring (*8*); those for 1950 are from Agricultural Statistics (*15*).
(b). Includes dolomite and other liming materials, land plaster, manganese and boron compounds, and other secondary and trace nutrient materials.
(c). Includes sand and other inert materials.
(d). The estimated figure for the year ended June 30, 1951 is 20 percent.

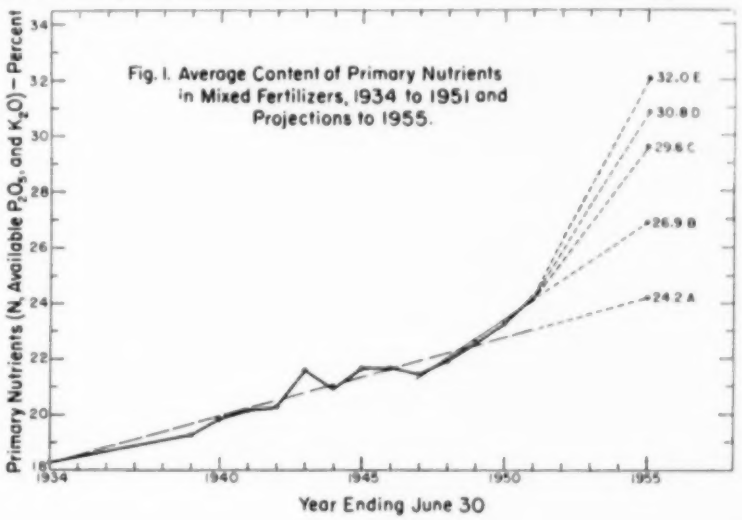

Table IV. - Estimated consumption of materials and primary nutrients as mixed fertilizers in 1950-51

Type of material	Materials in mixed fertilizers			Materials in all fertilizers			Portion of nutrients used as mixed fertilizers
	Quantity	Nutrient content (a)		Quantity	Nutrient content (a)		
		Quantity	Proportion (b)		Quantity	Proportion (b)	
	Tons	Tons	Percent	Tons	Tons	Percent	Percent
N	2,110,000	568,500	26.9	4,734,000	1,192,300	25.2	47.7
N-P_2O_5 (c)	100,000	39,100	39.1	299,000	116,700	39.1	33.5
P_2O_5 (d)	6,720,000	1,518,600	22.6	8,972,000	2,008,200	22.4	75.6
K_2O	2,252,000	1,254,900	55.7	2,503,000	1,379,800	55.1	90.9
Miscellaneous	2,796,000 (e)	—	—	4,481,000 (f)	31,200	0.7	—
Total	13,978,000	3,381,100	24.2 (g)	20,989,000	4,728,200	22.5 (h)	71.5

(a). N, available P_2O_5, and K_2O.
(b). Weighted average.
(c). Almost entirely ammonium phosphate and ammonium phosphate-sulfate.
(d). Excluding raw mineral phosphate used for direct application to the soil.
(e). Limestone, land plaster, secondary and trace nutrient materials, conditioning agents, inert filler, and other materials added to mixed fertilizers.
(f). In addition to the materials indicated in footnote (e), this category includes the quantities of raw mineral phosphate (1,040,000 tons), land plaster, and secondary and trace nutrient materials applied directly to the soil as fertilizers and soil amendments.
(g). Excluding the miscellaneous materials the average was 30.2 percent.
(h). Excluding the miscellaneous materials the average was 28.6 percent.

Table V. - Estimated distribution by types of materials of the increase over 1950-51 in the supply of primary nutrients programmed for 1954-55

Type of material	Quantity of materials	Nutrient content (a)		Content of primary nutrients in fertilizer materials used in 1950-51 (b)
		Quantity	Proportion (b)	
	Tons	Tons	Percent	Percent
N	1,892,000	694,300	36.7	25.2
N-P_2O_5 (c)	1,411,000	589,600	41.8	39.1
P_2O_5 (d)	2,253,000	1,031,700	45.8	22.4
K_2O	1,393,000	805,200	57.8	55.1
Phosphate rock (e)	200,000	6,000	3.0	3.0
Total	7,149,000	3,126,900 (f)	44.9 (d)	28.6 (d)

(a). N, available P_2O_5, and K_2O.
(b). Weighted average.
(c). Ammonium phosphate, ammonium phosphate-sulfate, and nitraphosphates. The K_2O content of nitraphosphate products is included in that of the potash materials.
(d). Excluding raw mineral phosphates for direct application to the soil.
(e). Raw mineral phosphates for direct application to the soil.
(f). Differs from the sum of the individual figures because of rounding.

Table VI. - Estimated consumption as mixed fertilizers of the increase in the supply of primary nutrient materials programmed for 1954-55

Type of material	Quantity of materials	Nutrient content (a)		Content of primary nutrients in materials used in mixed fertilizers in 1950-51 (b)
		Quantity	Proportion (b)	
	Tons	Tons	Percent	Percent
N	903,000	331,400	36.7	26.9
N-P_2O_5 (c)	470,000	196,500	41.8	39.1
P_2O_5	1,704,000	780,500	45.8	22.6
K_2O	1,267,000	732,200	57.8	55.7
Total	4,344,000	2,040,600	47.0	30.2

(a). N, available P_2O_5, and K_2O.

(b). Weighted average.

(c). Ammonium phosphate, ammonium phosphate-sulfate, and nitraphosphates. The K_2O content of nitraphosphate products is included in that of the potash materials.

and to the territory served by the plants.

Miscellaneous Materials in Mixed Fertilizers

MIXED fertilizers commonly contain large quantities of miscellaneous materials, chiefly limestone and inert filler, that do not carry primary nutrients. The average content of such materials in all mixtures increased from approximately 14 percent in 1920 to 20 percent in 1950-51 (Table III). Although the content of inert filler decreased from about 12 to 9 percent, this was more than offset by the increase in secondary and trace nutrient materials, mostly limestone added as both a neutralizing agent[4] and a makeweight filler.

Variations in the concentration of primary nutrients in mixed fertilizers are generally reflected in the quantities of miscellaneous materials present in the mixtures. For example, a study of the composition of mixed fertilizers consumed throughout the United States in 1949-50 (3) showed averages of 20.0 and 8.1 percent of acid-insoluble ash plus carbonate, the latter being expressed in terms of calcium carbonate, in the mixtures used in the South Atlantic and Mountain regions, respectively. Similarly, the mix-

[4] As used in this paper, the term "neutralizing agent" refers specifically to material, such as dolomitic limestone, added to mixed fertilizers for the primary purpose of overcoming the physiological acidity of nitrogen compounds.

tures averaged 20.2 and 30.1 percent of primary nutrients. The 3-9-6 mixtures averaged 22.3 percent of ash and carbonate, as compared with 14.5 and 8.9 percent, respectively, in the 3-12-6 and 3-12-12 grades.

For the country as a whole, reduction in the use of added filler appears to offer the greatest opportunity for increasing the concentration of primary nutrients in mixed fertilizers and lowering the unit cost of the nutrients to the farmer. To make the best of this opportunity will necessitate (1) that most of the inert filler added merely for makeweight purposes be eliminated and (2) that the use of inert conditioning agents be reduced to a minimum. The question of neutralizing agents, added for the purpose of overcoming the physiological acidity of nitrogen compounds, constitutes a more complicated phase of the problem. Although complete elimination of neutralizing agents will probably not be advisable until such time as adequate farm liming programs are firmly established throughout the country, and this applies particularly to the South, many States already have such programs and progress to this end is being made in other States. The need for neutralizing agents in mixed fertilizers should be re-examined at frequent intervals and steps taken to reduce their use to the lowest levels consistent with conditions in the individual States. Aside from its use specifically as a neutralizing agent, large quantities of limestone are added to mixed fertilizers merely for makeweight purposes.

Of the secondary nutrient elements, large quantities of calcium and sulfur are supplied to mixed fertilizers as integral parts of the primary nutrient materials, and magnesium is a principal constituent of dolomitic limestone, the chief neutralizing agent in the mixtures

Table VII. - Estimated total consumption of primary nutrient materials as mixed fertilizers in 1954-55

Type of material	Materials in mixed fertilizers			Materials in all fertilizers		
	Quantity	Nutrient content (a)		Quantity	Nutrient content (a)	
		Quantity	Proportion (b)		Quantity	Proportion (b)
	Tons	Tons	Percent	Tons	Tons	Percent
N	3,013,000	899,900	29.9	6,626,000	1,886,500	28.5
$N-P_2O_5$ (c)	570,000	235,600	41.3	1,710,000	706,400	41.3
P_2O_5 (d)	8,424,000	2,299,100	27.3	11,225,000	3,039,900	27.1
K_2O	3,519,000	1,987,100	56.5	3,896,000	2,185,000	56.1
Phosphate rock (e)	---	---	---	1,240,000	37,200	3.0
Total	15,526,000 (f)	5,421,700	34.9	24,697,000	7,855,000	33.3 (d)

(a). N, available P_2O_5, and K_2O
(b). Weighted average.
(c). Ammonium phosphate, ammonium phosphate-sulfate, and nitraphosphates. The K_2O content of nitraphosphate products is included in that of the potash materials
(d). Excluding raw mineral phosphates for direct application to the soil.
(e). Raw mineral phosphates for direct application to the soil.
(f). Differs from the sum of the individual figures because of rounding.

Table VIII. - Quantities of mixed fertilizers producible at several nutrient levels from the estimated supply of primary nutrient materials available for this purpose in 1954-55 (a)

Premise	Content of primary nutrients	Quantity of mixed fertilizers	Content of miscellaneous materials (b)		Difference in miscellaneous materials relative to premise B	
			Quantity	Proportion	Quantity	Proportion
	Percent	Tons	Tons	Percent	Tons	Percent
A. Proportion of primary nutrients is the same as in 1950-51.	24.2 (c)	22,404,000	6,878,000	30.7	+2,249,000	+48.6
B. Continuation of trend in primary nutrient concentration for 1946-47 to 1950-51.	26.9	20,155,000	4,629,000	23.0	---	---
C. Total quantity of miscellaneous materials is the same as in 1950-51.	29.6	18,322,000	2,796,000	15.3	-1,833,000	-39.6
D. Total quantity of miscellaneous materials is 75 percent of that in 1950-51.	30.8	17,623,000	2,097,000	11.9	-2,532,000	-54.7
E. Total quantity of miscellaneous materials is 50 percent of that in 1950-51.	32.0	16,924,000	1,398,000	8.3	-3,231,000	-69.8

(a). Based on a supply of 15,526,000 tons of primary nutrient materials containing 5,421,700 tons of N, available P_2O_5 and K_2O.
(b). Limestone, land plaster, secondary and trace nutrient materials, conditioning agents, inert filler, and other materials added primarily for purposes other than to supply primary nutrients.
(c). This figure coincides with the projection to 1954-55 of the long-time trend in the average nutrient concentration of mixed fertilizers for the period 1933-34 to 1950-51.

(*6, 7, 10*). On the other hand, requirements for trace nutrient elements (boron, copper, manganese, zinc, etc.) in mixed fertilizers must be met mostly if not entirely by additions of their compounds specifically for this purpose. Trace-element materials comprised about 0.65 percent of the total weight of mixed fertilizers used in the calendar year 1950 (*51*). It is expected, however, that the proportion will increase substantially as time goes on.

Materials and Primary Nutrients in Mixed Fertilizers, 1950-51

AS shown in Table IV, 71.5 percent of the total quantity of primary nutrients used in 1950-51 was consumed as mixed fertilizers. The corresponding proportions of the N, available P_2O_5, and K_2O were 47.1, 73.1, and 90.9 percent, respectively. It is estimated that the primary nutrients in the mixed fertilizers were supplied by 11,182,000 tons of materials, of which straight phosphate products accounted for 60 percent. These materials averaged 30.2 percent of primary nutrients, as compared with 24.2 percent in the finished mixtures. The downgrading resulted from the addition of 2,796,000 tons of miscellaneous materials containing no primary nutrients. The average nutrient content ranged from 22.6 percent in the straight phosphate materials, to 26.9 and 55.7 percent in the straight nitrogen and potash materials, respectively.

The nitrogen in the mixtures was supplied chiefly by ammonium sulfate and ammoniating liquids, with smaller quantities from ammonium phosphate products, natural organics, and other materials. Normal superphosphate was the source of most of the P_2O_5, but substantial quantities were supplied by triple superphosphate and by ammonium phosphate products. The potash was mostly from high-grade potassium chloride.

Forecast for 1954-55

DATA relative to the increase over 1950-51 in the supply of primary nutrients and their materials programmed for 1954-55 are given in Tables V and VI.

It is estimated that the increase in the supply of materials available for use in mixed fertilizers will average 47.0 percent in primary nutrients as compared with 30.2 percent in the materials used for this purpose in 1950-51 (Table VI). The increase in nutrient concentration reflects the very much larger proportions of high-analysis nitrogen and P_2O_5 materials, especially the latter. The expansion in the supply of nitrogen for mixed fertilizers will be principally in the form of such concentrated materials as ammonium nitrate, urea, and ammoniating liquids. Triple superphosphate and the ammonium phosphate products will furnish the bulk of the expansion in P_2O_5, while high-grade potassium chloride will continue to be the dominant source of potash.

It should be mentioned that for the purpose of this paper, the nitraphosphate products are largely excluded from the category of materials for mixed-fertilizer production, since it appears that, in general, these products do not lend themselves advantageously to further processing.

The estimated total supplies of the different types of primary nutrient materials for mixed fertilizers in 1954-55 are shown in Table VII. The indicated quantities of materials and nutrients are those for 1950-51 (Table IV) plus the subsequent increases to 1954-55 (Table VI). Thus, it is estimated that the primary nutrients for mixed fertilizers in 1954-55 will be furnished by approximately 15.5 million tons of materials averaging 34.9 percent of N, available P_2O_5, and K_2O, as compared with about 11.2 million tons averaging 30.2 percent of nutrients in 1950-51.

Nutrient Level in 1954-55

THE nutrient levels and the proportions of miscellaneous materials associated with the quantities of mixed fertilizers producible from the supply of primary nutrient materials anticipated for this purpose in 1954-55, have been computed under several premises (Table VIII, Figure 1). The premises are:

A. The proportion of primary nutrients is the same as in 1950-51.
B. The trend in nutrient concentration for 1946-47 to 1950-51 is continued.
C. The total quantity of miscellaneous materials used in mixed fertilizers is the same as in 1950-51.
D. The total quantity of miscellaneous materials is 75 percent of the quantity in 1950-51.
E. The total quantity of miscellaneous materials is 50 percent of the quantity in 1950-51.

Under these premises, the level of primary nutrients in mixed fertilizers in 1954-55 would range from 24.2 to 32.0 percent, corresponding to a range of 30.7 to 8.3 percent in the proportions of miscellaneous materials. Under premise B, which assumes continuation of the trend during 1946-47 to 1950-51, the nutrient level in 1954-55 would be 26.9 percent as compared with 24.2 percent in 1950-51. At the same time, however, the proportion of miscellaneous materials would increase from 20 percent to 23 percent. Premises C, D, and E provide for further acceleration of the nutrient-level trend, with corresponding reductions in the proportions of miscellaneous materials. Thus, under premise D, the mixed fertilizers would contain 30.8 percent of nutrients and 11.9 percent of miscellaneous materials. Relative to premise B, this would represent an increase of 14.5 percent in the nutrient level and decrease of 54.7 percent (2,532,000 tons) in the quantity of miscellaneous materials.

As previously mentioned, large quantities of calcium and sulfur are supplied to mixed fertilizers by the primary nutrient materials themselves. Furthermore, the use of limestone merely as a makeweight filler is commonly practiced in many parts of the country. In view of these facts, it appears that an average level of 11.9 percent of miscellaneous materials in mixed fertilizers would permit, for the country as a whole, approximately the same proportions of conditioning agents and of liming materials—to serve as neutralizing agent and to supply nutrient magnesium, where needed—as were present in 1950-51. It would also permit the addition of trace nutrient materials at or somewhat above the 1950-51

(*Turn to Page* 125)

Applicators' Problems of

FORMULATION

by

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WHETHER a fungicide is used as commercially prepared or changed by addition of other substances, its nature and potenital effectiveness in the field depends on active ingredients, spray supplements, proportions of the various components, method of combining them, and treatment of the mixture up to the time it is applied. These factors must be studied, controlled, and tested until the product is uniform and dependable.

Good manufacturing formulation is difficult because it requires much testing of the fungicide after various methods of manufacture. Because of this difficulty, research workers find that they have to help in the laboratory and field testing of most new fungicides. This leads to the problem of field formulation, wherein manufacturers' products may be mixed with one or another spray supplement, or with other fungicides, or perhaps even with synergistic chemicals, and then applied to plant surfaces in various ways.

There has been a great increase in the number of chemicals used as fungicides in recent years. Prior to the last decade only a few materials were in use, but now, according to McNew, McCallan, and Miller who compiled a recent summary for the American Phytopathological Society's committee on spray residues, 64 different fungicides are recommended by plant pathologists for plant disease control in the U. S. These include more than 64 chemicals. There are 46 fungicides being recommended for foliage application and 34 for seed treatment, soil disinfestation, and tuber treatment. Within crops, some fruits show the greatest diversity in choice of materials with 27 being recommended for use; and among the diseases, apple scab heads the list with 20 fungicides being used.

These 64 fungicides apparently have found a place in the disease control program despite the difficulties encountered in the introduction of each new fungicide, and despite a great deal of comment in the literature as to the shortcomings of some of these materials. Perhaps some of these shortcomings would disappear if more attention could be given to formulation, said to be one of the weakest links in the production and testing of fungicides. In addition to the active ingredient or ingredients, many spray supplements may be added to a fungicidal preparation. Most frequently the spray supplements may be classed as wetting agents, spreaders, safeners, deposit builders and anti-foaming agents.

Before considering some of the spray supplements, it might be well to consider briefly the shortcomings that are frequently present in the active ingredient itself. Dermatitis suffered by the spray applicators, and various shades of phytotoxicity to the sprayed plants, frequently result, not only from the toxicant itself, but also from undesirable impurities introduced during manufacture. Lack of stability during storage and photosensitivity of the deposit on the plants, also sometimes occur. The end result is erratic field performance and thus sometimes the adequate field testing of a new material may be delayed needlessly. Perhaps such disadvantages in a new material cannot wholly be eliminated before the chemical receives widespread and adequate field testing and then progresses beyond the pilot plant stage of development. Nevertheless, such "bugs" are a constant source of annoyance to the applicator who may have spent a year testing the new material.

Talk given at annual meeting, Amer. Phytopath. Soc., Fungicide Colloquium Section, Sept. 9, 1952, Ithaca, N. Y.

Particle Size Stressed

ANOTHER factor of importance in field testing is particle size. Only a few fungicides are available in the liquid state, or solution, most being formulated as wettable powders and applied to plant surfaces in the particulate suspension. Oftentimes considerable variation occurs in particle size. It is known that particle size is important in determining deposit, distribution, and effectiveness of a fungicide. There is also much in the literature to show that the fungicidal action of a given quantity of a chemical varies directly with particle size. Greater efficiency may be expected from a material having the maximum surface area exposed.

Further, tenacity, one of the most important characteristics of a fungicide, is greatly influenced by particle size, in that small particles

tend to resist weathering much longer than large particles. In the case of some dusts, however, it is possible to bring some toxicants into such a fine state that the particles will not adhere to plant surfaces. It would seem that particle size in a toxicant is worth consideration when a material is being formulated. It is not uncommon to have applicators in the field report unsatisfactory performance of a material due to its particle size.

Wetting agents are of primary importance since most of the fungicides now being used are formulated as wettable powders. If too little of a wetting agent is used, the material remains difficult to wet, and if too much wetting agent is used, there may be foaming in the tank. Either error is likely to result in poor deposition on the plant surface, and poor retention. Some wetting agents have also been shown to be somewhat toxic to fungi and thus serve two purposes—wetting and enhancing the fungicidal action.

Spreader stickers are frequently used as spray supplements in fungicidal mixtures, although there is considerable diversity of opinion as to their value. The statement is frequently made that the addition of a spreader sticker does not aid in disease control, although the fungicidal deposit was increased in some cases. However, more and more data have been appearing in the literature to show that spreader stickers seem to have a place. Some kinds of leaves are particularly difficult to wet, yet fungicidal coverage is necessary for disease control. A good example may be hop mildew. The upper surfaces of the leaves are easily covered with a fungicide, but the lower surfaces are naturally difficult to wet and require a spreader sticker for adequate coverage.

The addition of a resin-type sticker to bordeaux has increased its efficiency greatly for the control of snapdragon rust. Certain spray supplements, such as those containing protein, function not only as spreader-stickers for the spray deposit, but also increase the fungicidal action of fixed copper. Various kinds of vegetable oils have been reported as adding greatly to the tenacity of some fungicides and it has been reported recently that spreader stickers greatly improve the distribution pattern of some organics on tomato foliage. The adherence of dusts is said to have been improved when formulated with the addition of clay and oil.

At other times, spreader stickers have been found to decrease fungicidal action. The general opinion expressed in the literature indicates that the most soluble fungicidal materials seem to be the most toxic and the least tenacious. If the tenacity is improved with stickers, the fungicidal value is usually reduced. It would seem that formulators could determine the possible value of stickers and spreaders under controlled conditions rather than have the applicator test them in the field. Too often the comment is made at the end of the field season, "good fungicide, but not retentive on foliage." Many new materials could be improved greatly if they were made more tenacious on plant surfaces.

Various materials are sometimes added to fungicides as an aid in preventing phytotoxicity. Lime is perhaps most commonly used for this purpose. Certain glyceride oils have been reported as safening agents for various copper spray materials. However, in most cases, when a fungicide is safened by the addition of various spray supplements, it is also likely to be reduced somewhat in fungicidal effect. Perhaps the place to reduce or eliminate phytotoxicity in a fungicide is during manufacture and not by field mixing on the part of the applicator.

Mixtures Examined

RECENTLY, it seems to have become fashionable for field experimenters to juggle formulation in the field by mixing two or more fungicides together in the spray tank or dust hopper. In recent years the A.P.S. Sub-Committee on Testing New Fungicides has been compiling an annual summary of fungicide tests. In these annual reports 62 combinations are recorded in which two or more fungicides have been used together, each fungicide usually being used at reduced dosage. Sulfur heads the list of materials that have been used in combination, in that 18 other materials have been combined with it. The phenyl mercuries are second with 14 combinations being listed. Perhaps in the near future various combinations of some antibiotics with standard fungicides will be seen. It is not clear whether such fungicide combinations result in better control of plant diseases or not. In general, disease control from such mixtures reflects the effect of the most potent of the constituents, although some mixures do seem to have better fungicidal properties than either of the components.

Manganese ethylene bis dithiocarbamate appears to have been improved by the addition of sulfur and ferbam. For the control of apple scab, the combination of a phenyl mercury and sulfur may have certain advantages, because both eradicant and protectant properties may result. In general, however, with the phenyl mercuries, and perhaps with others, it is not certain whether such combinations are a good practice. Reactions may occur to cut down the effectiveness of the mixture. Frequently, chemical decomposition of one or both the components occurs.

It has been reported that good control of anthracnose and late blight may be obtained by the combination of ziram and a fixed copper, but decomposition of the mixture occurs and lowers fungicidal efficiency. This decomposition may be prevented by the addition of skimmed milk powder. Prevention of decomposition has also been recorded if skimmed milk powder is added to the combination of basic copper sulfate and ferbam. It has been well demonstrated that the addition of such metals as zinc, iron, and manganese to certain carbamates will increase fungicidal efficiency greatly. Increased retention has also been reported when some metallic sulfate-lime complexes have been added to various organics.

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How Revisions During 1952, affected

State Fertilizer Control Laws

by

John D. Conner

Washington, D. C. Attorney

This article by Mr. Conner supplements his three-installment series published in the November and December, 1951 and January, 1952 issues of Agricultural Chemicals. The current article brings the reader up to date with summaries of fertilizer laws enacted in 1952. — Editor.

LAWS regulating the manufacture and sale of fertilizers were amended in three states in 1952 —Kentucky, Louisiana and Virginia. This relative paucity of new state fertilizer controls would seem more reflective of an "even year" legislative season, in which only twelve state legislatures were in session, than indicative of reaching "Babel's zenith." It will be recalled that ten new or amended laws were enacted in 1951 legislative season.

The impropriety and lack of necesssity for federal legislation in the fertilizer field was stressed in the final report, released in 1952, of the Select Committee to Investigate the Use of Chemicals in Food and Cosmetics, and the adverse report of the Department of Agriculture on S1693 of the Eighty-second Congress. The latter was a proposal which would duplicate at the federal level, the extensive controls now imposed on the manufacture and sale of fertilizers in each of the forty-eight states.

The Delaney Committee, which has not particularly distinguished itself as an advocate of less federal controls in the chemical field, stated in its final report on fertilizers that:

> "While the quality and quantity of food production are of national concern, no reliable evidence was presented to this committee to indicate that the use of chemical fertilizers presents a hazard to man or animals. The specific type of fertilizer required in any particular area is a local problem and can best be regulated on the local level. Almost without exception, witnesses expressed satisfaction with existing controls of fertilizers, and voiced their opinion that Federal legislation is not necessary."

To the same effect was a report by the Department of Agriculture to the Senate Committee on Agriculture and Forestry on the merits of S1693. This report concluded:

> "It is our considered opinion that matters relating to the registration, branding, composition, and guarantee of fertilizers and fertilizer materials should remain subject to the applicable laws and regulations of the several states. The proposed bill would assign such functions to an instrumentality of the Federal government. Such action would serve no apparent useful purpose. It would, in my judgment, handicap through dual regulation, the efficient distribution of fertilizers. The Department recommends that the bill not be passed."

Kentucky

THE system for the payment of tonnage fees on commercial fertilizer sold in Kentucky has been changed by the enactment of House Bill 70 on March 4, 1952, to conform with the system employed in the majority of states. However, the level of the fee is the same and keeps Kentucky in the column of states having the highest tonnage fees. The fee of 50 cents for each ton of fertilizer sold is now based on monthly, quarterly or semi-annual reports which must be submitted on the tenth day of the month following the period covered. The manufacturer or dealer may select the type of period report made. Companies reporting on the quarterly basis must file in April, July, August, October and January. When the semi-annual basis is selected, reports must be made in July and January.

Louisiana

THE Anhydrous Ammonia Fertilizer and Equipment Law of Louisiana which was enacted in 1948 and amended in 1950 was again amended on June 23, 1952, with the enactment of House Bill 421. The new amendment relates to the administration of the Anhydrous Ammonia Commission and permit fees for dealers in anhydrous ammonia. The basic fertilizer law is unaffected.

Virginia

A comprehensive revision of the fertilizer law of Virginia was approved on March 11, 1952.[1]

Although the old and new laws both cover commercial fertilizers, the latter defines the term to include fertilizer material and mixed fertilizer and in turn defines each of these. "Fertilizer material" is defined as any substance containing nitrogen, phosphoric acid, potash or any recognized plant food element or compound which is used primarily for its plant food content, value in promoting plant growth, or for compounding mixed fertilizer. Specifically excluded from this definition are unmanipulated animal and vegetable manures, agricultural liming materials and gypsum. The term "mixed fertilizer" is defined as any combination or mixture of fertilizer materials designed for use or claimed to have value in promoting plant growth.

The annual registration fee of

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[1] In the administrative field, the Virginia Department of Agriculture announced on February 28, 1952, that the distribution of fertilizer-insecticide mixtures would not be authorized except for the specific use of research personnel at the experiment Stations in Virginia.

Entomological subjects include toxicology, flavor alteration, insect resistance, new control chemicals and public relations as

A.A.E.E. and E.S.A. Meet

A FULL program covering practically every phase of agricultural pest control plus an all-day discussion of abnormal flavors in foods due to the presence of pesticidal residues, featured the sixty-fourth annual meeting of the American Association of Economic Entomologists at Philadelphia, December 15-18. The meeting marked the final gathering of the A.A.E.E. as such, since it was to amalgamate with the Entomological Society of America as of January 1. The new group is known as the Entomological Society of America.

Dr. Charles E. Palm, head of the Department of Entomology, Cornell University, Ithaca, N. Y., was named first president of the new E.S.A., which has a membership of over three thousand. Dr. Palm was also elected president of the A.A.E.E. for the interim between the annual meeting and the year's end, to succeed Dr. E. F. Knipling, U. S. Department of Agriculture, Washington, D. C. Alvah Peterson was named A.A.E.E. vice-president.

Dr. H. H. Ross, University of Illinois, Urbana, was elected president of the old E.S.A. for the interim. After January 1, he was to be president-elect of the new Society, taking office in 1954. As interim president of the old E.S.A., Dr. Ross succeeds Dr. E. G. Linsley, University of California, Berkeley.

Occupying the entire meeting time of Tuesday, Dec. 16, a food taste symposium, with Fred W. Fletcher, Dow Chemical Co., Midland, Mich., as moderator, attracted a large crowd in the main meeting room. Dr. Lloyd Beck, Yale University, led off the discussion by presenting a paper, "The Nose as a Molecular Analyzer." He contrasted the functions of the eye and nose, pointing out that the eye performs a "synthetic" function, that is, it is unable to determine the makeup of various colors, whereas the ear is "analytical." It can usually distinguish individual sounds among many

Photo Below:

Members of food taste panel which participated in the all-day program of December 16. Chairman of the program was Fred W. Fetcher, Dow Chemical Co., Midland, Michigan, standing, third from right in picture.

Panel members presented many new ideas in taste-testing procedures and techniques, to lend new light on the entire subject of possible abnormal flavor in foods, resulting from the application of insecticides.

Above: Dr. Charles E. Palm (left) receives gavel from outgoing A.A.E.E. president, E. F. Knipling. Dr. Palm is first president of newly-organized E.S.A.

and has the ability to "tune out" noises it does not wish to hear. The nose, he said, is like the ear, being able to distinguish separate molecular components of a mixture. He explained the methods used in six experiments and concluded that there can be no smell primaries in the same sense that there are primary colors from which other colors and shades are made. This information was regarded as basic in establishing methods of tasting and otherwise evaluating flavors.

Dr. Elly H. Hinreiner, department of Food Technology, University of California, Davis, discussed further the subject of taste-testing methods, reporting on experience obtained in studies made on the west coast. Dr. Hinreiner said that small, trained panels of specially-selected persons were used in the tests. About 40 judgments on food taste are made by from 10 to 15 persons in tests replicated a number of times.

Checks are made on four tastes: off, sweet, acid and bitter, to determine the degree of influence, if any, imparted by various chemical residues. Minute amounts were used, ranging from 1-2 ppm and sometimes as high as 10-15 ppm. Human senses are often more sensitive to such additions than are delicate chemical tests, it was pointed out. A different panel is used for each type of test and care is taken to work under optimum conditions: not too soon following a meal; with food samples not too hot to taste comfortably; and the

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It's Los Angeles for '53

The 1953 meeting of the new Entomological Society of America will be held at the Los Angeles Biltmore Hotel, Los Angeles, California, December 7-10, it was announced at the Philadelphia convention.

The 1954 meeting place was also announced. It will be at the Rice Hotel, Houston, Texas at a date yet to be decided.

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In the photos: Top (L to R) Dr. F. S. Arant, Auburn, Alabama; Dr. M. P. Jones, Mississippi State College and W. A. Stephen, North Carolina State College, Raleigh.

Second row: Coleman C. Edgar, Hercules Powder Co., Wilmington, Del.; W. Mercer Rowe, Ashcraft-Wilkinson Co., Atlanta, Ga.; Jack Brunton, Jack Polite and F. E. Meadows, Kolker Chemical Co., Newark, N. J.

Third row: Dr. W. E. McCauley, Julius Hyman Div., Shell Chemical Corp., Denver, Colo.; T. H. Mailen, Phillips Chemical Co., Bartlesville, Okla. and Dr. Bailey B. Pepper, N. J. Agricultural Experiment Station, New Brunswick, N. J.

Fourth row: C. R. Weaver, Ohio Agricultural Experiment Station, Wooster; Mancefield Barrow and E. N. Woodbury, Hercules Powder Co., Wilmington, Del.; and Kelvin Dorward, U.S.D.A., Washington, D. C.

Fifth row: Dr. D. M. DeLong, Ohio State University, Columbus, Ohio; Dr. H. G. Crawford, Ottawa, Ontario, and Dr. H. G. Walker, Pennsylvania Salt Mfg. Co., Philadelphia.

Bottom row: M. A. Manzelli, Virginia-Carolina Chemical Co., Richmond, Va.; Harry L. Haynes, Carbide & Carbon Chemical Corp, Boyce Thompson Institute, Yonkers, New York; Russell W. Gies, Pennsylvania State Department of Health, Media, Pa.; and Walter W. Abramitis, Armour & Co., Chicago, Ill.

use of samples which are identical in every way except for the addition of pesticide residues. Dr. Hinreiner stated that control samples are sometimes difficult to obtain, since without the use of pesticides, the samples are often so badly insect-ridden that they cannot be used in the test.

Continuing the discussion, Howard L. Stier, National Canners Association, Washington, D. C., described some simplified statistical procedures for evaluating flavor differences. He illustrated some of these, pointing out that the accurate analysis and interpretation of data from experiments involving taste and flavor differences need not necessarily require use of the classical and more complicated statistical method.

Photos (Top) L to R: Sterling Kyd, University of Missouri, Columbia, Mo.; Dr. George C. Decker and H. B. Petty, Illinois Natural History Survey, Urbana, Ill.; and J. M. Wright, University of Illinois, Urbana.

Second row: G. G. Rohwer, U.S.D.A.; Mrs. Rohwer; and Joseph F. Spears, B.E.P.Q., Hicksville, L. I., N. Y.

Third row: Dr. Ernest N. Cory, A.A.E.E. secretary-treasurer, University of Maryland, College Park; Dr. Roy E. Campbell, former A.A.E.E. president, Whittier, Calif.; and W. D. Reed, U. S. Army Engineer Corps., in charge of all entomological work of the army. Recently returned from tour of Korea and Japan.

Fourth row: Donald W. Hamilton, U.S.D.A., Vincennes, Ind.; Dr. J. W. Apple, University of Wisconsin, Madison; and Dr. C. C. Alexander, Geigy Co., Inc., New York.

Fifth row: Dr. E. F. Knipling, retiring A.A.E.E. president; Dr. Charles E. Palm, newly-elected president of A.A.E.E. and new E.S.A.; Dr. E. G. Linsley, University of California, Berkeley, retiring president of old Entomological Society of America; and Dr. H. H. Ross, University of Illinois, Urbana, president-elect of the new E.S.A. (He was also elected president of the old Society for the interim between meeting time and first of the year.)

Bottom photo: group relaxing between sessions at Bellevue-Stratford. Standing, L to R: Robert J. Geary; Robert A. Corey, F. L. Gambrell; C. W. Kearns, Dan Shankland; Robert E. Hamman; R. W. Nelson, George C. Decker; Guy J. Goble; J. M. Wright; and E. H. Glass. (Seated, L. to R.): Dr. H. S. Telford, Tom A. Brindley, H. B. Brelsford; M. B. Leonard and Jack Reed.

"The Use of Preference Test Methods for Detecting Off-Flavors in Foods" was the title of a paper presented by D. R. Peryam, Quartermaster, Food and Container Institute, Chicago, Ill. He said that under certain conditions, preference tests can provide a more delicate measure of flavor differences than the more complex discrimination tests.

A paper on Agricultural Chemicals and Flavor Evaluation was presented by Dr. C. C. Compton, Julius Hyman Div., Shell Chemical Corp., Denver, Colo. He stressed the concern felt by the agricultural chemical industry at the lack of adequate data on flavor deviation. He asked the questions, should the industry give up now and be satisfied with present cost and performance of pesticides? Must research be grounded until insect resistance to present-day insecticides has developed? Can we expect the bumper crops we have enjoyed during the past fifteen years to continue without sooner or later encountering reduced yields due to insect and disease attack supplemented by adverse weather conditions? Must we learn to prefer the distasteful products of fermentation and molds in fruit and vegetables due to lack of pest control? These and other questions were set forth by Dr. Compton in his paper, which appears in full elsewhere in this issue.

Others appearing on the morning's program included Howard Reynolds, U. S. Bureau of Human Nutrition and Home Economics, Beltsville, Md.; W. H. Ewart, University of California Citrus Experiment Station, Riverside; and W. A. Rawlins, Cornell University, Ithaca, N. Y.

The discussion of taste-testing was continued in the afternoon session of Tuesday, with Dr. H. G. Johnston, National Cotton Council of America, Memphis, Tenn., as moderator. A paper discussing the effect on the flavor of milk from feeding lindane was presented at this session. It indicated that an abnormal flavor exists in milk when lindane is fed at high levels of intake. However, it seems highly improbable that

the feeding of forage sprayed with recommended dosages of lindane would cause excretion of sufficient amounts of lindane in the milk of dairy cows to produce objectionable flavors. For example, the paper said, a cow, consuming 22 pounds (10 kilograms) daily of a forage containing 10 parts per million of lindane, will receive only 100 milligrams of lindane daily. The paper was prepared by five authors: Ray E. Ely, R. W. Bell and L. A. Moore, Bureau of Dairy Industry; and H. D. Mann and R. H. Carter, Bureau of Entomology and Plant Quarantine.

R. O. White, U.S.D.A., Pro-

Photos this page

Top row (L to R): Dr. C. H. Curran, New York Natural History Museum, New York and M. M. Darley, Commercial Solvents Corp., New York. Dr. Avery S. Hoyt, chief, Bureau of Entomology and Plant Quarantine, U.S.D.A., Washington, D. C.; Dr. H. L. Haller, assistant chief, B.E.P.Q., Washington, D. C.; and C. A. Clark, General Foods Corp.

Second row: Dr. Charles E. Palm, newly-elected president of new E.S.A. and Dr. E. F. Knipling, retiring president, A.A.E.E. George L. Langford, editor, "Entoma", University of Maryland, College Park, Md.; M. B. Leonard, Julius Hyman Division, Shell Chemical Corp., Denver, Colo.; and Ernesto Groskorth, of El Salvador.

Third row: Dr. C. C. Compton, Julius Hyman Div., Denver; and Jack Waston, J. M. Huber Co., New York. Russell W. McCalley, Pittsburgh Agricultural Chemical Co., New York; Howard Elmer; Dr. Rosmarie Von Runker, Fabriken Bayer, Germany; and Dr. R. C. Scott.

Fourth row: Howard Baker, A.A.E.E. program committee chairman and Dr. Fred C. Bishopp, assistant chief, B.E.P.Q., Washington, D. C. Kelvin Dorward, B.E.P.Q., Washington, D. C.; Dr. Palm; and E. L. Thomas, Swift & Co., Chicago.

Fifth row: H. Douglas Tate, Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn.; and Bert Dickerson, U. S. Industrial Chemicals, Baltimore, Md. Kenneth K. Krausche, Pennsylvania Salt Mfg. Co., Philadelphia; Joseph A. Noone, National Agricultural Chemicals Association, Washington, D. C.; Donald E. Hope and Harold Lindaberry, Pennsylvania Salt Mfg. Co., Philadelphia.

Bottom row: Fred Luthi, Shell Chemical Co. export department, New York; and Stephen S. Easter, Food and Agriculture Organization, United Nations, Rome, Italy. Dr. Elly Hinreiner, University of California, Davis; Dr. Lloyd Beck, Yale University, New Haven, Conn.; and Dr. D. R. Peryam, quartermaster, Food and Container Institute, Chicago, Ill. (All three appeared on the panel discussing the influence of pesticides on flavor of fruits and vegetables.)

duction and Marketing Administration, Washington, D. C., told the group that toxicants shipped in interstate commerce are subject to registration under the Insecticide, Fungicide and Rodenticide Act of 1947. Thus, labeling adequate for the protection of the public is required. Mr. White questioned label claims for applications in which, if the control material is applied as directed, altered flavor may result in fresh or processed foods, or quality may be lowered in other ways.

"The Influence of processing on flavor changes due to applied chemicals" was discussed by C. H. Mahoney, National Canners Association, Washington, D. C. He reported that in the past, "definite and specific changes in flavor of fruits and vegetables have occurred" after processing and storage, making the acceptance of such foods impossible by the consuming public."

He declared that on some occasions it has been necessary to destroy these packs of canned foods at considerable cost. Changes in quality and flavor in these instances were directly attributed to the use of certain insecticides, he said, and advised that further studies be made to acquire more data on solutions for such problems.

To complete the day's consideration of altered flavors in foods, a panel composed mainly of persons who presented papers previously, answered questions from the floor and expanded some of the points made in earlier talks. Moderator of this panel was L. G. Cox, chairman designate, subdivision of pesticides, Division of Agricultural and Food Chemistry, American Chemical Society.

Stresses Pesticide Values

IN his presidential address on Tuesday morning, Dr. Edward F. Knipling, assistant chief, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, A.A.E.E. head, told his audience that many persons throughout the world would die, or suffer serious illness, if insecticides and repellents were not used to protect them from insect attack. His talk, "The Greater Hazard—Insects or Insecticides?" put the emphasis on the credit, rather than the liability side, for pesticides and their use. "When we consider our insecticides as man-savers rather than man-killers, it calls for an entirely different outlook on the matter of calculated risks in employing insect control chemicals," he declared. "We must remember that, because of the many diseases they transmit, insects are responsible for the death of millions of people each year and the illness of several hundred million more."

Dr. Knipling said that in the field of medically-important insects, the question arises whether it is better to recommend using a chemical having a calculated health risk, or to deny people the protection this chemical can give them against a disease carrier. The answer is plain, when one realizes that DDT alone has saved perhaps 5 million lives and no less than 100 million illnesses have been prevented through its use since about 1942. These include control of malaria, typhus, and dysentery to mention only a few.

Compared to this outstanding record of helpfulness, not one person has died or become seriously ill (excluding accidental deaths or suicide attempts) from exposure to DDT in connection with the control of insects. "This is the best way I know to estimate the relative hazard of the insects and this insecticide," he commented.

The A.A.E.E. president also cited chlordane as a compound whose usefulness completely outdistances its potential harm, and mentioned the fact that other toxicants are also free of any offensive history.

Insect resistance was discussed at some length, with the conclusion that "either substitutes for current insecticides or other methods of control must be found for these insects." He told of encouraging indications coming from coordinated research, but pointed out that the long lapse of time usually involved in the testing and marketing of new products offers some discouragement. This could be helped, he said, through a coordinated entomological, chemical and toxicological investigation which he termed as "essential for efficient research planning and rapid progress in developing new and safe control measures for insects."

The address was concluded with reference to the role of the new Entomological Society of America in meeting toxicological problems. He pointed out specifically the need for improved public relations and recommended that the new Society give more program time to the discussion of toxicological problems in future meetings.

While entomologists may be proud of their achievements in improving health and living standards, such advancements could not have been made without the contribution of chemists and toxicologists, he said. Further progress will require even more help from these specialists and the rapidity of future achievement will depend largely upon how well the research of entomologists, chemists and toxicologists is coordinated, Dr. Knipling concluded.

Public Relations Panel

AN invitational panel discussion on "Public Relations in Entomology" brought out the unusual importance of this work in the face of many adverse stories in newspapers and magazines across the country. Moderator of the panel was Wallace Moreland, director of public relations, Rutgers University, New Brunswick, N. J. Speakers on the panel were M. R. Budd, assistant director of advertising, Hercules Powder Co., Wilmington, Del. and David G. Hall, in charge, Division of Information, U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, Washington, D. C.

The panel cited many instances to indicate that the public is not aware of the benefits it enjoys through the work of entomologists. If people knew the truth about entomology and its scientists, and the contribution they make in the field of commercial crops of fruits and

(*Turn to Page* 112)

Soil Technology, Sales Methods Discussed at Dallas Meeting of

Agricultural Ammonia Institute

EXPERIMENTAL developments in the use of anhydrous ammonia, the action of ammonia in the soil, selling ammonia, and soil organic matter, were among the reports highlighting the third annual convention and trade show of the Agricultural Ammonia Institute, which was held December 3, 4, and 5 at the Baker Hotel, Dallas, Texas. More than 340 members and guests registered at the meeting of this relatively new association, and elected a new slate of officers, headed by Jeff I. Davis of the Southeastern Liquid Fertilizer Co., Albany, Ga. as president for 1953. The retiring president, Virgil Rule, Greenville Liquid Fertilizer Co., Greenville, Miss., will continue to serve on the board of directors.

Other officers were elected as follows: 1st vice president, M. C. Craft, Midwest Fertilizer Co., Springfield, Ill.; 2nd vice-president, H. Pugh, Pugh Gin & Fertilizer Co., Tiller, Ark.; secretary, W. D. Tucker, Jr., John Blue Co., Huntsville, Ala.; and treasurer, R. H. Wooten, Mid-South Chemical Co., Inc., Memphis, Tenn. The executive committee will consist of the officers and T. Talbot, Chemco, Audubon, Ia., and Clyde Marshall, Commercial Solvents Corp., New York.

After the welcoming address by president Rule, Dr. W. B. Andrews, Mississippi State College, Miss., reviewed the work done to date with anhydrous ammonia and discussed the general subject of soil organic matter. In his report, he pointed out that in view of the increasing population of the United States (about 2½ million per year), it will be neces-

Agricultural Ammonia Institute Board of Directors, taken at meeting Standing (L to R): Joe Whittington—Mathieson Chemical Co., Baltimore, Md.; Ed Gill—Flint Steel Corporation—Memphis, Tenn.; K. (Doc) Eldon—Continental LP Products — Dallas, Texas.; J. L. Tullis—The J. B. Beaird Co., Inc. Shreveport, La.; W. D. Cook—Suburban Farm Service Co.,—Whippany, N. Jersey; Ernest Fannin—Fannin Gas & Equipment—Phoenix, Arizona; Virgil Rule—Greenville Liquid Fert. Co. — Greenville, Miss.; F. J. Schwarzer—Tex-Ammonia, Inc.—Elsa, Texas; R. E. Poethig (Alternate for Col. Ellsworth L. Mills); Bastian-Blessing Company—Chicago, Illinois; E. W. Thomas—Farm Service Corporation—Booneville, Missouri; Tully W. Talbot—Chemco — Audubon, Iowa; George W. Gray—Verkamp Ammonia Inc.—Cincinnati, Ohio; J. L. Brooks—Mid-Tex Fert. Company—Waco, Texas; Charles H. Boylan—The Weatherhead Company—Cleveland, Ohio; J. C. Berry—Louisiana Liquid Fert. Co.—Bossier City, La.; and John W. Dugan—Plantation Anhydrous Ammonia Co—Houma, La.

Seated—left to right: Clyde Marshall—Commercial Solvents Corp.—New York, N. Y.; General R. H. Wooten—Mid-South Chemical Co.—Memphis, Tenn.; Hampton Pugh—Pugh Gin & Fertilizer Co. — Tiller, Arkansas; Jeff I. Davis — Selco — Albany, Georgia; Mark C. Craft—Midwest Fert. Co.— Springfield, Ill.; W. D. Tucker, Jr.—John Blue Company — Huntsville, Alabama; M. B. Raub—M. B. Raub Company—Chalmers, Indiana; and W. M. Banks—Illinois Anhydrous Ammonia—Farmer City, Ill.

sary to increase crop output considerably . . . and that anhydrous ammonia offers a means of increasing crop yields to meet this anticipated demand. He indicated also that anhydrous ammonia offers not only an economic supply of nitrogen for soil fertilization but that this form is particularly adaptable in application and that young plants either prefer this form, or use it as well as the nitrate form.

Dr. Andrews explained that when anhydrous ammonia is released into the ground and covered immediately after application, it combines with the soil and forms a solid. In this form it does not leach out of the soil until it breaks down into the nitrate form, which takes from four to six week weeks in the spring and much longer when it is cold. He continued to point out that anyhdrous ammonia is more effective than nitrate, particularly in dry years.

Must Sell Idea

ACCORDING to J. I. Davis, Jr., in a report on "Selling Ammonia," the important factor in the use of ammonia as a nitrogen source, is "selling the farmer." Mr. Davis encouraged the use of demonstrations to show the farmer what nitrogen will do for the soil, and the farmer's crop. He endorsed the practice of applying anhydrous ammonia to one acre of the prospective customer's field, without cost to the farmer, and thus providing visible evidence of the effect of nitrogen on crop yield. Education of 4H members and FFA members, as to what nitrogen and ammonia are, will provide still further progress in increasing sales.

Other factors discussed were the importance of a service and safety program for users of anhydrous ammonia, and the need for standardization of applicator equipment. Members were encouraged to cooperate with and make use of the state agricultural experiment stations.

Mr. Davis presented a series of slides illustrating anhydrous ammonia application equipment, and results obtained on various crops, using anhydrous ammonia. Favorable results have been obtained on oats, corn, fescue, barley and wheat. He reported that Georgia recommendations specify 200# N per acre for Bermuda grass. . . also that experiments are being conducted on the planting of oats and application of anhydrous ammonia at the same time. The ammonia is released at a depth of four inches, and the oats are planted three to three and one-half inches deep.

A more complete discussion of ammonia application was presented in a report by W. Peck, Phillips Chemical Co., Bartlesville, Okla. According to Mr. Peck, the anhydrous ammonia application equipment in current standard use is not vesatile enough to permit use at all the times that anhydrous ammonia can be applied. He indicated further, that irrigation application of ammonia presents still other problems in application. Mechanical features of application differ for various crops and areas. Ammonia is applied at depths of six to 14 inches, and in some cases as deep as 22 inches.

Mr. Peck reported on the preplanting of corn applications of ammonia and of other operations in which ammonia is applied in combination with working the land, using chain drags to seal the ground after application. He indicated further, that nitrogen can be applied from a short time before planting corn, to as long as a tractor can be brought into the field after planting. In irriga-

(*Turn to Page 109*)

The Executive Committee is shown, left, top. (L to R): Clyde Marshall—Commercial Solvents Corp.—New York, N. Y.; General Ralph H. Wooten—Mid-South Chemical Co.—Memphis, Tenn.; Tully W. Talbot—CHEMCO—Audubon, Iowa; Hampton Pugh—Pugh Gin & Fertilizer—Tillar, Arkansas; Jeff I. Davis, Jr.—SELFCO—Albany, Ga.; Mark Craft—Midwest Fertilizer Co.—Springfield, Ill.; and W. D. Tucker, Jr.—John Blue Company—Huntsville, Alabama.

Lower photo (L to R): Bob King, Western Fertilizer Co., Muleshoe, Texas; Ed Sumner Jr. of A. T. Sumner Co., Sheldon, Ill., Ed Nelson of Edw. S. Nelson Ltd., Clarksdale, Miss.; Stonewall Brandon, Southwest Fertilizer Co., Pecos Texas; A. J. Malvezzi of the KBH Corporation, Clarksdale, Miss., and B. C. Abbott, Mid-States Fertilizer Co., Decatur, Ill.

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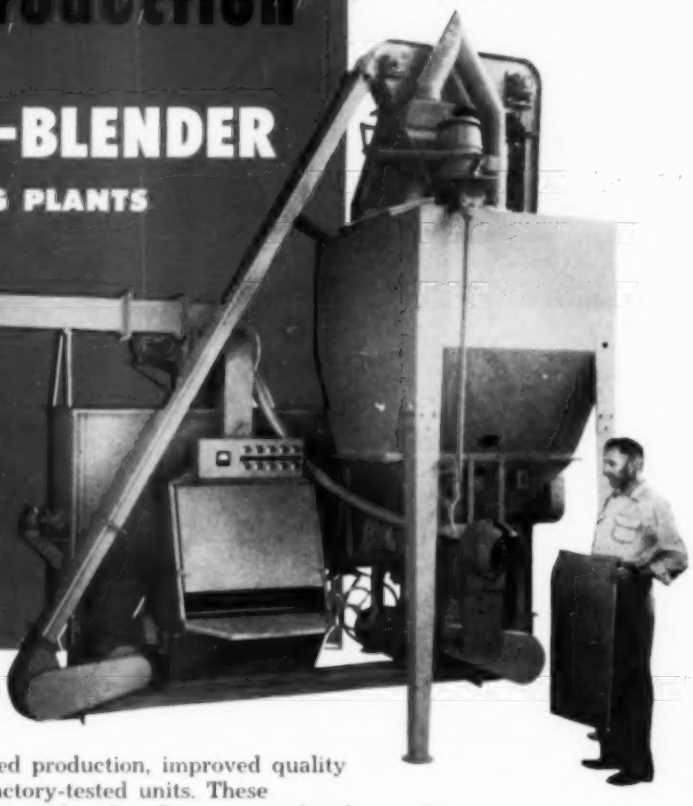

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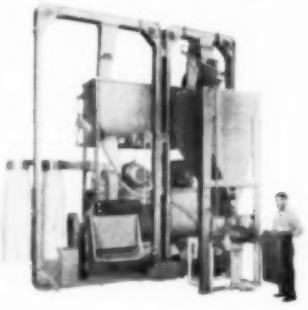

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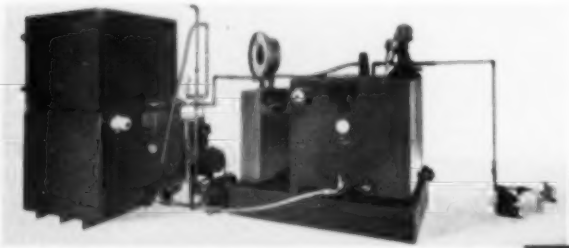

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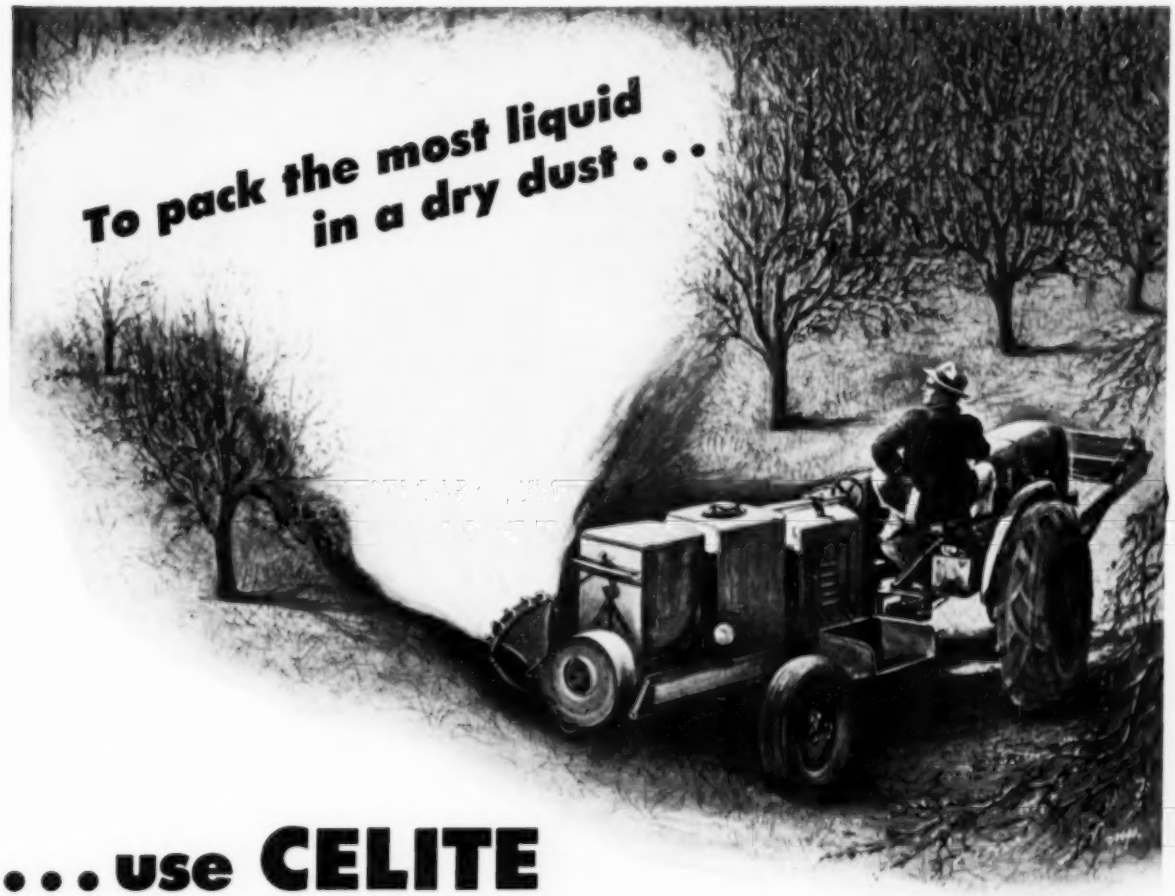

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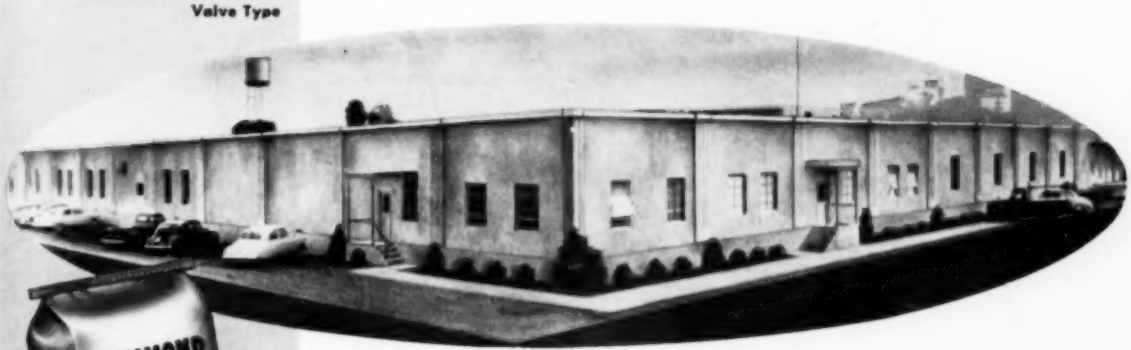

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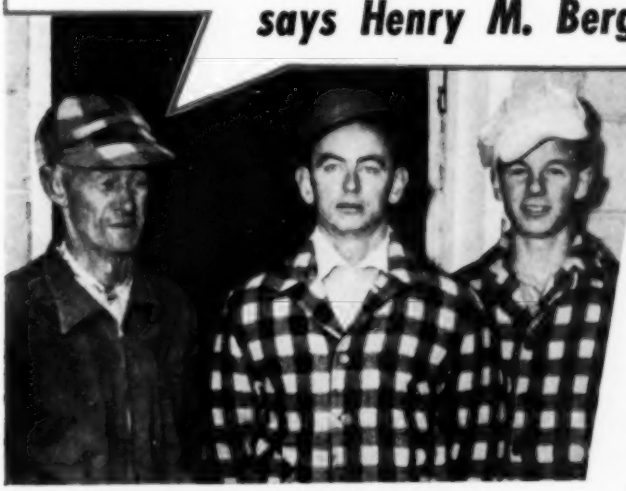

Mr. Berg is shown here on his farm with two of his three sons, Robert (center) and Duane (right).

With results like this, it's easy to see why Henry M. Berg of Blanchardville, Wis., calls his use of 10-10-10 complete fertilizer on pastures "the best investment we ever made."

In 1951, Mr. Berg and his sons applied 10-10-10 to his pastures at the rate of 560 pounds per acre and fenced off a portion as a test plot. The yield per acre on this fertilized plot was 8,025 pounds against 3,750 pounds of dry matter on unfertilized fields. The unfenced portion, used for pasture, furnished fresh grass for cattle all summer long.

In 1952, 250 pounds of 10-10-10 were used and the results were approximately the same.

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1952 Highlights in Research on

Cotton Pest Control

by

M. D. Farrar*

Entomologist, Clemson Agricultural College, Clemson, S. C.

TWO insects that attack cotton held the spotlight for 1952. Of these, the pink bollworm attracted the greatest attention. All of the cotton industry apparently became aroused over the potential destructiveness of this pest. The available resources of the U.S. Bureau of Entomology and Plant Quarantine, the states infested and the National Cotton Council, were put behind a program. Several special meetings were called to help stem the tide of this insect. In the face of all this, the pink bollworm demonstrated that under favorable conditions it could still be a most dangerous cotton pest. In areas where only a few scattered larvae occurred a year ago, 25-40 larvae per boll were not uncommon this past year.†

This situation was particularly serious in areas where an early harvest and early stalk destruction are almost impossible. Since this is the condition over the greater portion of the cotton belt, development of the pink bollworm should be a warning that its spread into non-infested areas must not be permitted.

Although controlled effectively by the heavy application of organic insecticides, the added cost to profitable cotton production may lead to greatly reduced cotton acreage in the event that the insect becomes widespread.

The "bollworm" leads the parade of the insects destructive to cotton. None of the cotton producing states escaped losses from this insect. Collections of bollworm larvae showed that the tobacco budworm was as abundant as the bollworm. Early in the season the budworm exceeded the bollworm, but late in the season the reverse was true.

Entomologists are in agreement with the fact that bollworms are more difficult to handle following the use of organic insecticides. Though very effective killing agents for bollworms, their use in the cotton pest control program so reduces the abundance of beneficial insects that bollworms may go "out of bounds." Bollworm control is very difficult without the aid of these beneficial insects. The problem is how to use the new organic insecticides without upsetting the biological balance between destructive and beneficial species of insects.

Technique Important

THE technique of bollworm control may be a most productive field of investigation. The introduction of organic poisons has completely changed the relations of this pest to cotton production. There are perhaps three approaches to the problem. The present insecticides may be used more effectively, or a new chemical may be discovered that is more specific, or one may be found that is less specific and sufficiently destructive to eliminate all insects attacking cotton. The answer must be left to the future.

With the exception of bollworm control, schedules recommended in 1952 were adequate to produce a good crop of cotton. A comparison of the schedules between states shows a striking uniformity based on the use of the recognized materials DDT, aldrin, dieldrin, toxaphene, heptachlor, BHC, sulphur, and parathion which all played important roles in the 1952 schedules. Probably only minor changes will be made in the 1953 schedules which will include some of the new chemi-

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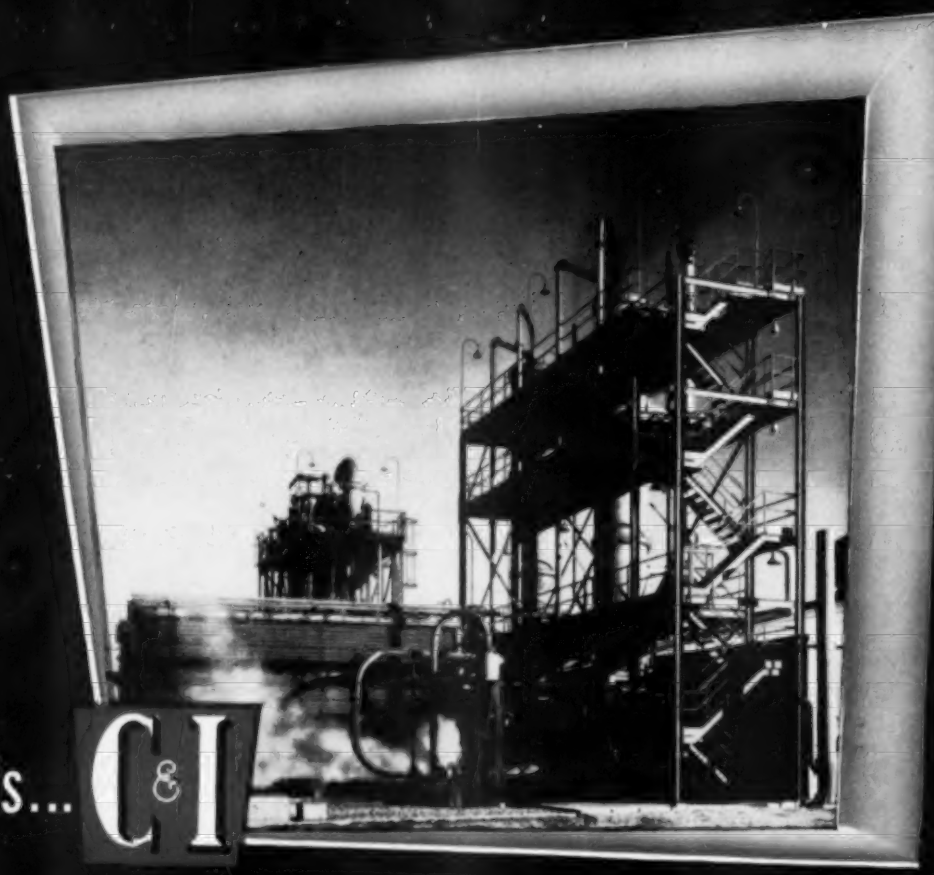
* Presented before The National Cotton Council, Insect Control Conference, Memphis, Tenn., December 10, 1952.

† Data from L. C. Fife, J. G. Watts, South Carolina; C. M. Beckham, Georgia; F. S. Arant, Alabama; L. D. Newsom, Louisiana; E. W. Dunham, Mississippi; C. R. Parencia, J. C. Gaines, Jr., Texas.



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cals that showed promise in the 1952 research program.

The outstanding new chemical for 1952 was endrin (Compound 269, Shell Chemical Corporation). Endrin is a stereoisomer of dieldrin with properties superior to dieldrin as a cotton insecticide. The experimental performance of endrin indicates that it may take a prominent place in the list of insecticides for use on cotton. Against thrips and cutworms it was effective at 0.1 pounds per acre. A dosage of 0.2 pounds per acre controlled boll weevils and moderate bollworm infestations, but heavy bollworm outbreaks required double that amount per acre. In these schedules aphids did not build up, indicating satisfactory control of aphids. The effect of this chemical on beneficial insects is not fully understood, but endrin's generally high toxicity would indicate that it probably would destroy them.

Isodrin, the stereoisomer of aldrin did not turn in an outstanding performance on any cotton insect other than the boll weevil. Since aldrin is already established as an effective boll weevil toxicant, only further experimental work will demonstrate the advantages of either compound as a cotton insecticide. Isodrin is toxic to boll weevils at the same level as aldrin.

For bollworm control, DDT still remains the most effective chemical. It may be used effectively with BHC, or with toxaphene for somewhat higher efficiency. When properly timed, the recommended insecticide mixtures kept bollworms under control. It was necessary under emergency conditions to increase the dosage of DDT to 10 per cent in the BHC-DDT mixture, mix DDT with toxaphene or increase the rate of toxaphene to about 3 pounds per acre.

Although DDT may be the most specific bollworm insecticide where bollworms alone are concerned, DDT is not the best over-all insecticide chemical for cotton. Only under severe bollworm conditions does toxaphene fail to give adequate control. Endrin promises to be an equally good general purpose cotton insecticide. Both are excellent boll weevil poisons, a property lacked by DDT.

Aldrin, isodrin, chlordane, and heptachlor are satisfactory insecticides for boll weevils and several other cotton pests. They are not satisfactory for the control of bollworms and must be fortified by the addition of DDT when bollworms are to be controlled.

Proper Timing Essential

IMPROPER timing of insecticides for bollworm control has resulted in many reported failures of the insecticide to kill bollworms. Experimental data supports the printed recommendations for the control of bollworms, where the recommended insecticides are properly applied at the right time. This point cannot be over-emphasized in planning schedules for cotton growers.

In the early season sprays and dusts for the control of thrips, aphids, and other pests attacking seedling cotton, all of the recommended cotton insecticides are satisfactory at almost one half the usual dosage per acre. Entomologists differ in their opinions as to the value of early season treatments. Growers should follow their respective state recommendations as to the justification for applying early season treatments for insect control on cotton.

Boll weevils were, for the most part, held in check by adverse weather conditions. However, in many sections boll weevils were very destructive. They accounted for many low yields where cotton farmers failed to apply the recommended insecticides. Effective materials were BHC, toxaphene, aldrin, dieldrin, and heptachlor. Of the new materials, isodrin and endrin are most promising. Methyl parathion at 0.25 and 0.47 pounds per acre, EPN at 0.5 pounds per acre and metacide at 0.25 to 0.5 pounds per acre appear promising. These will probably not be applied specifically for boll weevil control, but when used against red spider mites may destroy boll weevils.

The season gave an opportunity for testing a series of new compounds for the control of red spider mites. Against this cotton pest the phosphate compounds dominated the experimental program. The outstanding chemical was "Systox." At 0.25 pounds per acre, one or more applications gave an almost complete clean up of red spider mites. When applied in two or more applications at about 0.25 pounds per acre satisfactory red spider mite control was obtained with parathion, methyl parathion, EPN, and malathon. Other chemicals giving satisfactory control were metacide, aramite, C-1100, R-242, and 40 per cent sulphur. There were striking differences between the two common species of spider mites in tests reported by Dunnam at Stoneville, Mississippi.

In a summary of the highlights for 1952 one may re-emphasize a few important facts:

1. There are several good organic insecticides available that will destroy one or more cotton insects or pests. The uses of these have been formulated into schedules that will permit cotton farmers to grow cotton, reasonably free of insect damage, where they follow a recommended schedule.
2. The outstanding cotton pest not generally distributed is the pink bollworm. The potential destructive nature of this insect is of grave concern to the cotton industry.
3. The cotton bollworm becomes the most difficult insect to handle under the present insecticide schedules. Entomologists will have to solve this problem that has been made so acute following the introduction of organic insecticides.
4. The new insecticide, endrin, offers the most promise as a cotton insecticide due to its high toxicity to a wide variety of cotton insects.
5. The chemical, "Systox," looks good as a control for red spider mites. Other phosphate compounds may also develop into satisfactory materials. Industry has several acaricides under test.

The insecticide industry is meeting the challenges brought about by insect resistance and the need for a greater variety of toxicants for crop protection. Here is a story of the new Memphis plant of

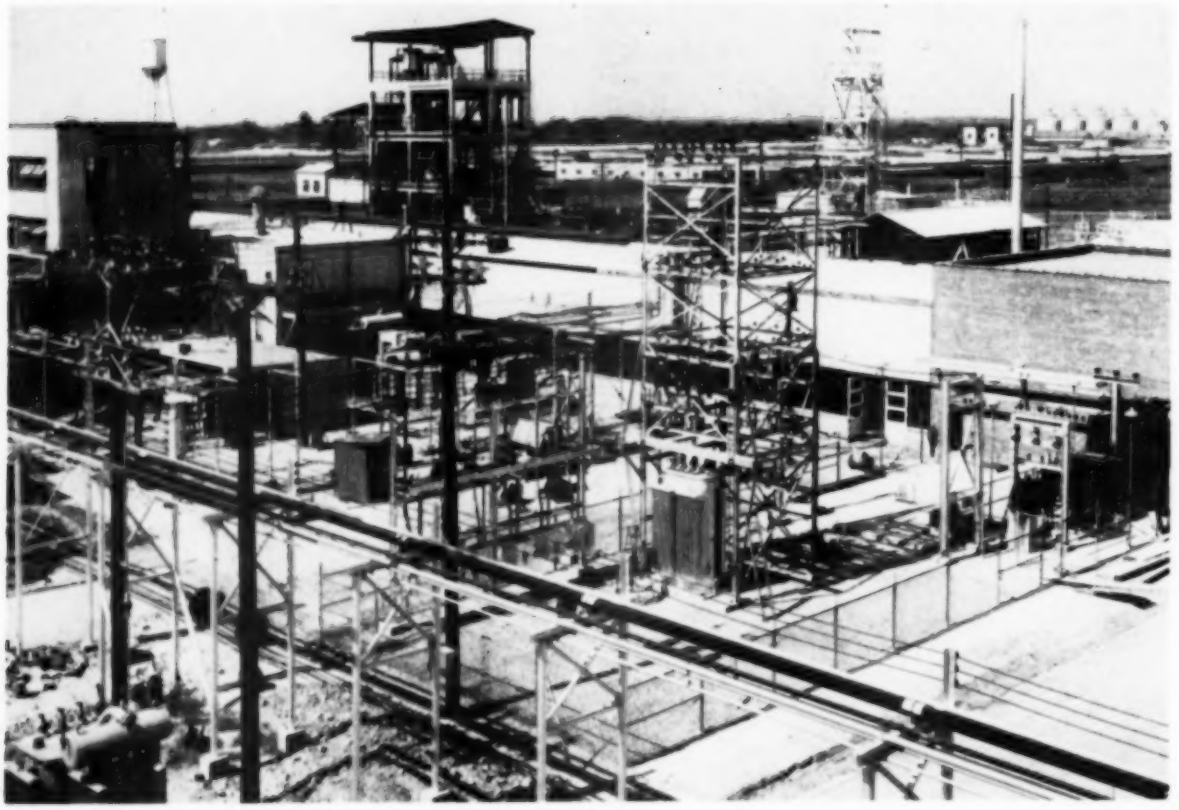
Velsicol

WITH the announcement last month by Velsicol Corporation that their new plant in Memphis, Tenn., has just gone into commercial production of heptachlor, the final paragraph was put to a story of research and development in the agricultural insecticide field which extends back over a period of several years. Because this story is typical of the insecticide industry, and because it illustrates the vast amount of technical work, testing and collaboration among chemical engineers, entomologists, physiologists, etc., that must be done before a new insecticide may be brought to market, it was felt that many readers of *Agricultural Chemicals* would be interested in having the background on this interesting story.

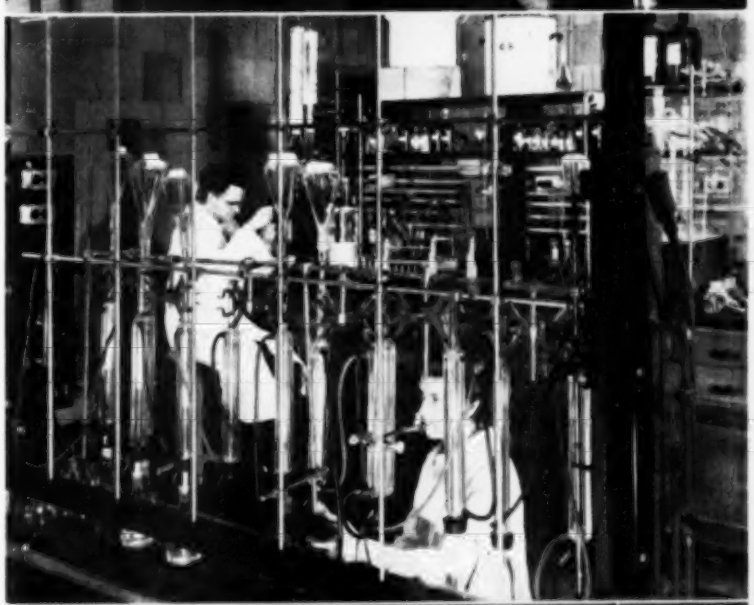
In the beginning, heptachlor was only one of a group of chlorinated hydrocarbon compounds, developed in the Velsicol laboratories. Each was initially designated only by a laboratory code name. The exact degree of insecticidal properties toward a wide variety of insects could be determined only by a sequence of testing.

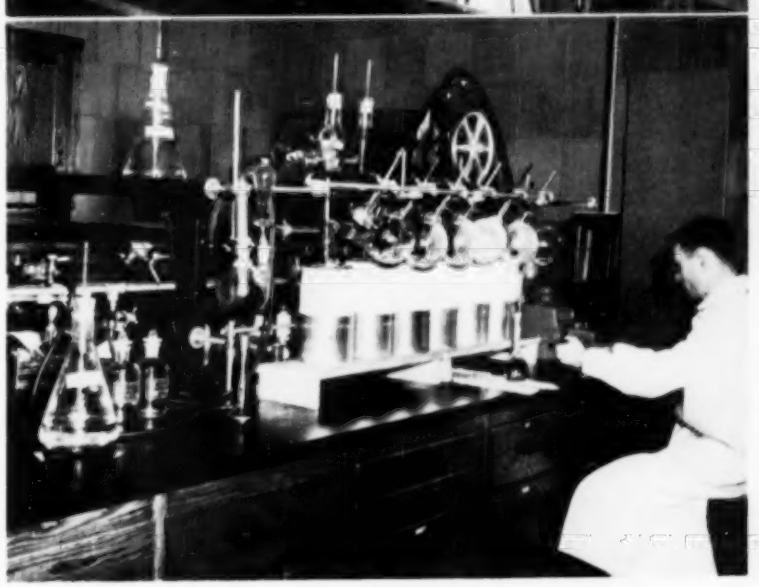
Preliminary Screening

FIRST in the comprehensive testing program came preliminary screening. Velsicol Corporation, like



Corp.





many other producers of basic insecticide raw materials, sponsors, research fellowships in entomology at leading universities. At one such institution the new compounds were subjected to test under laboratory conditions against several types of insects. These included the citrus red mite, spring tail, German roach, greenhouse thrip, milk weed bug, cabbage aphid, vegetable weevil, tiger moth, caterpillar, fruit fly, and red harvester ant.

Of the compounds tested, heptachlor proved to be remarkably effec-

Photo on opposite page: General view of Velsicol's plant at Memphis, Tenn. where chlorine, heptachlor and other products are manufactured.

Photos this page, top, left to right: H. O. Whamond, vice-president and Joseph Regenstein, Jr., president, Velsicol Corp.

Middle picture: Chromatographic columns in operation in Velsicol plant. These are used in connection with one stage of residue analysis being made on crops grown in heptachlor-treated soil.

Lower photo: Vacuum drying apparatus used by Velsicol in connection with crop residue analysis on heptachlor.

tive. The following data are typical of the results:

Additional tests confirmed the findings. This material still identified only by number, was therefore selected for application to field plots in formulations of varied concentration. Even after such extensive testing and confirmation of exceptional insecticidal activity there was still a long and costly way to go before marketing the new insecticide.

Commercial Formulation

THE heptachlor which had been used in testing up to this point was diluted in small quantities to the concentrations required for such testing. In order to test the material in field plots, it became necessary to prepare suitable formulations. This project was handled by the Velsicol Product Development Laboratory. The two general types of formulation considered for agricultural applications were emulsifiable concentrates and dusts.

In preparing water emulsion concentrates many emulsifying agents were evaluated to determine their performance characteristics in combination with heptachlor. In each case it was necessary to ascertain the degree of compatibility, dispersibility performance, and storage stability of the formulation. Tests were made on a great number of emulsifiers, and it was finally determined that at least twenty-five different emulsifying agents were satisfactory for use in combination with technical heptachlor.

For convenience in agricultural applications, an emulsifiable concentrate formulation containing two pounds of actual heptachlor per gallon was established as a standard. For general all around performance it was decided that approximately 6% by weight of emulsifying agent would be desired for the formulation. Packaging studies indicated that heptachlor emulsifiable concentrate formulations should be packed either in glass containers or in steel pails or drums having a high baked phenolic protective inner liner.

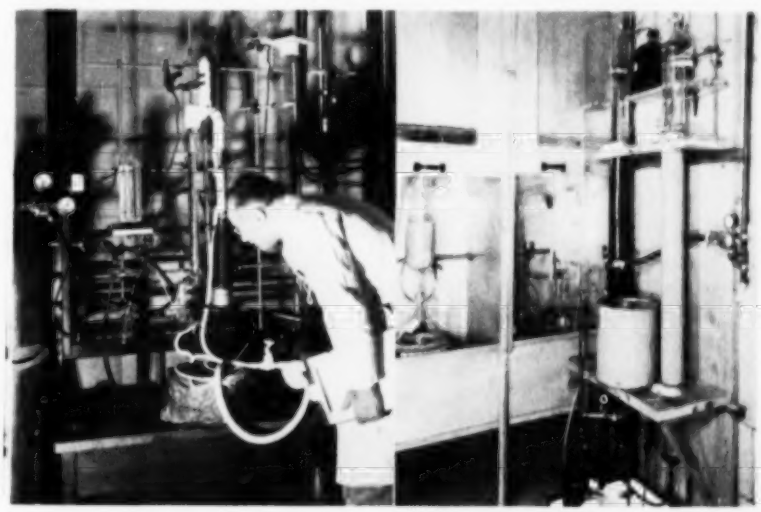
The development of commercial dust formulations required considerable work. Product development personnel tested the available types of inorganic carriers and diluents to determine their performance in combination with heptachlor. With these data compiled they then proceeded to develop formulation procedures which would serve as future guides for potential formulators. Based on the applications in which heptachlor was thought to be potentially most effective, the probable methods of application and equipment which would be used, and the anticipated rates of application per acre, the

Table I.

Test Insect	*Concentration Wt. Percent*	*Mortality 24 hours*
greenhouse thrips	0.01%	99%
" "	0.001%	87%
" "	0.00025%	14%
" "	0.0001%	3%

Test Insect	Concentration (Mg.* / sq. cm.)	% Moribund 24 hours
spring tails	2.55	100%
milk weed bug	2550.	100%
soldier flies	10.8	100%
German roaches	2550.	100%

*Mg. = micrograms



Upper photo (left) Low temperture distillation unit used in connection with product research and development. To the right is view of solvent extraction apparatus used in crop residue analysis on heptachlor.

Lower photo: Air view of Velsicol Corporation plant at Marshall, Illinois, where a major portion of the company's products are manufactured.

Products Development Laboratory decided to prepare the following four formulations for field testing:

1) 2½% heptachlor dust.
2) 2½% heptachlor-5% DDT dust.
3) 2½% heptachlor-5% DDT-40% sulfur dust.
4) 25% heptachlor wettable powder.

Products Development supplied the formulated samples distributed to qualified research workers throughout the United States for use in their test programs. Field reports concerning the performance characteristics of the formulations were returned to this laboratory and formulas modified in order to render them more effective from an application standpoint. The final data compiled as the result of this cooperative research are now incorporated in a Formulators' Manual, prepared for commercial processors of heptachlor. This publication describes in detail suggested methods of commercially producing heptachlor formulations.

Field Test Plots

AN important step in the testing of heptachlor was to try the material in varying formulations against a wide range of agricultural insects under a variety of field conditions. This work was done by several United States Department of Agriculture and State experiment stations in small scale field plots.

The first tests were promising. Succeeding tests for the control of grasshoppers showed that heptachlor, when used at the rate of 2 to 4 ounces of the actual material per acre, gave effective control. Small scale field tests were conducted on a number of other pests including soil insects, cotton pests, plum curculio, fleas, screw worm, mosquitoes, and others. The results were outstanding. Heptachlor gave control in each case even when used at a remarkably low dosage level.

Pilot Plant Engineering

FIELD testing had confirmed many applications where heptachlor formulations provided a marked degree of insecticidal effectiveness. Market analyses of the value of heptachlor for these applications indicated the practicality of further exploiting the product. To do so, however, required that considerably larger quantities of heptachlor be prepared under commercial scale production methods. The material would then be used in widespread large scale field tests in many parts of the country. It was apparent that a pilot plant would have to be constructed for heptachlor manufacture.

The first problem confronting the engineering staff was to devise a means of applying laboratory methods of synthesis to a series of unit production processes, all of which had to be coordinated to insure uniformity of end product. Then proper equipment had to be selected, and in some cases designed. Durability and proper flexibility under operating conditions were desired properties. Adequate facilities for handling raw materials were planned and constructed. Jacketed glass-lined reaction kettles were designed specifically for the manufacture of heptachlor, and resistant type piping was installed in the system.

The pilot plant was finally completed and all its equipment installed and operating. Experimental test runs were then made to establish the optimum conditions for each of the unit processes with such pilot plant apparatus. Analytical control tests were devised to plot the course of the process.

The pilot plant engineering work accomplished three purposes: *First*, it provided a means of producing sufficient quantities of heptachlor for the forthcoming comprehensive large scale field testing program. *Second*, engineering data were obtained that were desirable for the construction of a commercial plant. *Third*, the data pertaining to the economics of the production operation were made available.

Large Scale Testing

WHEN formulations had been developed and the pilot plant had produced in sufficient quantity, large scale tests were set up. Experi-

Table 2. Heptachlor applications approved by PMA

Crop	Insect Controlled	Application
Cotton	Boll Weevil, Cotton Flea Hopper, Tarnished Plant Bug, Rapid Plant Bug	2 lb. per gal. heptachlor emulsifiable concentrate, diluted and applied at rate of 2/3 pt. to 1 qt. concentrate per acre.
Cotton		2½% heptachlor dust applied at rate of 6-10 lbs. per acre early in season, and 10-15 lbs. per acre for late season.
Cotton	Thrips	2 lbs. per gal. heptachlor emulsifiable concentrate diluted & applied at rate of 1/3 - 2/3 pt. of concentrate per acre for early season control.
Cotton	Garden Webworm	2 lbs. per gal. heptachlor emulsifiable concentrate diluted & applied at rate of 1 - 1/3 pts. per acre.
Cotton		2½% heptachlor dust applied at rate of 12-14 lbs. per acre.
Alfalfa	Alfalfa Weevil	2 lb. per gal. heptachlor emulsifiable concentrate, diluted & applied at rate of 1 pt. concentrate per acre before alfalfa stand is 3 inches tall.
"	" "	1½% heptachlor dust applied at rate of 20 lbs. per acre before alfalfa is 3 inches tall.
Potatoes	Wireworms	2 lbs. per gal. heptachlor emulsifiable concentrate applied at rate of ½ to 1½ gals. per acre to the soil and disc into top 3 or 4 inches.
Range Grasses	Grasshoppers	2½% heptachlor dust applied at rate of 8-10 lbs. per acre after batching of grasshoppers is completed.

ment stations in all parts of the country cooperated in this phase of the testing. Tried under varied conditions using different types of formulations, heptachlor gave good control of wireworms at dosages of 1 to 3 pounds per acre as a broadcast soil treatment. Protection afforded to potatoes and other crops normally attacked by wireworms had been outstanding. Tests showed heptachlor to be equally effective against onion maggots, cabbage and turnip maggots, corn rootworms, white grubs, mole crickets, and several other soil insects.

Researchers on cotton insects in the southern states found heptachlor to be very effective against the boll weevil and several other cotton pests when applied at the rate of 4 ounces per acre. In the alfalfa-growing states of the West, heptachlor proved effective for the control of alfalfa weevils when applied at the rate of 4 ounces per acre. The actual list of insects against which heptachlor was tried, and on which many tests are still continuing, is a long one. The results from large scale field tests continue to be impressive as additional data are received.

Analysis of Residues

EARLY field observations established that heptachlor was initially rapid in its insecticidal action, and that the action persisted at a high level during the period of insect infestation, but that there was relatively little long lasting residual action late in the growing season. Researchers believed that this series of characteristics would considerably enhance the value of heptachlor for treating vegetable crops and forage. In controlling insect pests which infest such crops, the condition most desired is that the insecticide used be extremely effective during the period of infestation, and that it disappear from the crop during the active growing season. Heptachlor appeared to parallel these optimum conditions. To investigate this factor it became necessary to check accurately the minute quantities of heptachlor which

(*Turn to Page* 101)

The Listening Post

Test Fungicidal Control of Dwarf Bunt

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

SOIL contamination with bunt spores is an important source of infection of wheat in the Pacific Northwest. C. S. Holton and T. L. Jackson report experiments conducted by the U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering and the Washington State Agricultural Experiment Stations to determine the possibility of controlling dwarf bunt (*Tilletia brevifaciens*) by application of fungicides to the soil at the time of seeding winter wheat.

The fungicides included in the test were: "Ceresan M," "Spergon," "Agrox," and "Anticarie." They were applied with a conventional-type duster, powered by a gasoline motor, and mounted on a four-row custom-built seeder. Each of the four dust-delivering tubes was attached to a drill spout, so that the fungicide was blown into the drill-opening simultaneously with seed delivery. Each treatment was in blocks of four rows, 100 feet long, spaced one foot apart, and replicated three times, making a total of 1200 lineal feet of rows.

The fungicides were reduced to half strength by mixing them with equal amounts of either pumicite or talc. The diluted dusts were applied to the soil at the rate of about 200 pounds per acre in each of five locations in the Pacific Northwest. Smut percentages were determined by examing 100 heads at each of 12 random locations in each plot. The results are presented in Table I.

Of the four fungicides tested, only "Anticarie" gave significant control of dwarf bunt. It was highly effective in three locations but only slightly effective at a fourth (Elgin, Oregon). The amount of smut at the location (Goldendale, Washington) was too low for evaluation of the fungicides.

"Ceresan M" and "Agrox" reduced the stand materially below that of the check rows. There was no reduction of stand in the plots treated with "Spergon" or "Anticarie." At three locations the "Spergon" plots had more smut than the untreated plots. Further tests with "Anticarie" and other chlorobenzene compounds are in progress at rates of application that are more nearly practical economically.

Soil infestation by dwarf bunt has become a problem of increasing importance in the winter-wheat areas of the Pacific Northwest. Unlike the common form of bunt, dwarf bunt can persist in the soil for more than one year, even in the absence of a wheat crop. Seed treatment is ineffective in preventing infection due to this soil-borne inoculum. Therefore, it is hoped that there can be developed a practical method of control by soil disinfection at seeding time.

Black Rot Control

THE apple black rot fungus, *Physalospora obtusa*, causes leaf spot and canker of apple trees as well as black rot of the fruit. The

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leaf spot is often called frog-eye leaf spot. P.L. Poulos and J.W. Heuberger of the Delaware Agricultural Experiment Station report that in 1950, the black rot fungus caused severe defoliation in a young Lodi apple orchard at Bridgeville, Delware. This serious outbreak of frog-eye leaf spot was attributed directly to the failure of the grower to remove dead branches. In the previous year, 1949, the orchard had been severely damaged by fire blight (*Erwinia amylovora*) and the black rot fungus invaded the blighted twigs and branches, thus creating many centers of inoculum potential. This relation of the frog-eye leaf spot phase of the black rot diseases to the fire blight disease on apple has been noted several times in different places.

During 1952, a block of Starr apples at Bridgeville was selected, primarily for a fungicide spray experiment on control of fire blight. This block was chosen for three reasons: It had been damaged for the past five years by fireblight; the frog-eye leaf spot phase of the black rot disease had been present to some extent in 1951; and the orchardist had failed to remove dead wood for several years. Thus, the supply of infective material for both the fire blight and black rot diseases was so abundant that infection could be serious if weather conditions proved favorable, which did happen and both diseases became epiphytotic.

A preliminary report gives data on the control of frog-eye leaf spot. No data are available on the control of the fruit rot phase, nor on toxicity of materials to fruits, since there was no set of fruit in the block owing to six days of continous rain during the blossom period.

Several antibiotics and three ethylene bis dithiocarbamate compounds (Table 1) were applied to single-tree plots, replicated four times and randomized. All were used as sprays and were applied with an orchard sprayer, employing 450 pounds pressure, and using a 5-nozzle boom.

The first fungicide application was made on April 22 at the full pink to early bloom stage of blossom development. On the next day optimum conditions for the dissemination of and infection by the black rot fungus commenced. Rain fell almost continuously for the period April 23 to 29, inclusive, totaling 3.33 inches. Subsequent spray applications were made on April 30 (near the end of the full bloom stage), May 7 (late petal fall stage), May 19 (first cover stage), and June 4 (late second cover stage).

Frog-eye leaf spot infection was first observed on May 4. Control data were taken on May 9, 16,26, and 29, the trees being scored on an index basis of 0 (no infection) to 10 (100 percent infection). The average index for the four scoring dates is presented in Table I. These data show that three materials — "Parzate" (2500 ppm.), "Dithane Z-78" (2500 ppm.), and "Thiolution" (120 ppm.) —gave statistically significant control over the untreated at the 5 percent level.

None of the materials used caused any noticeable injury to the foliage.

As soon as it was observed that certain materials were giving control of frog-eye leaf spot, a block of bearing young Lodi trees in the same orchard was sprayed by the grower with "Fermate" (2-100), "Dithane Z-78" (2-100), and "Dithane D-14" plus ferric sulfate (2 qts.-1 lb.-100) to obtain information on possible fruit injury, if any; the antibiotic "Thiolutin" was not available in sufficient quantity for use in this work. Three applications were made, namely: approximately at the late petal fall stage, first cover stage, and second cover stage. Examination of the fruit, at harvest, showed considerable russeting from "Dithane D-14" plus ferric sulfate, some skin roughening from "Fermate," and no injury from "Dithane Z-78."

Table I.

Results of soil-treatment tests with four fungicides for the control of dwarf bunt in four varieties of winter wheat in the Pacific Northwest.

Soil	Percent of dwarf bunt in varieties indicated at— Troy Idaho	Worley, Idaho	Elgin, Oregon	Waterville, Washington	Goldendale, Washington
Treatment	Golden	Elgin	Elgin	Rio	Orin
Check	32	48	41	11	Tr.
Ceresan M*	34	31	37	2	Tr.
Spergon	46	54	48	9	Tr.
Agrox *	22	0	33	0.7	Tr.
Anticarie	2	0	33	0.7	Tr.

*These materials reduced the stand materially in all plots.

Fungus Damages Cotton

A NUMBER of microorganisms, aided by insect and mechanical injuries, are able to enter the unopened cotton boll and cause more or less damage to cortical tissues and boll

Table II.

Frog-eye leaf spot control, Starr variety of apple, Bridgeville, Delaware, 1952.

Treatment	Concentration (ppm)	Disease index (Average)
Untreated	—	6.4
Thiolutin	120	3.4
	60	6.2
	30	6.0
Terramycin	120	4.9
	60	4.6
	30	8.0
Streptomycin sulfate	120	6.3
	60	5.9
	30	6.2
Copper Rimocidin	120	4.7
	60	7.2
	30	6.6
Parzate	2500*	2.1
Dithane Z-78	2500*	3.2
Manzate	2500*	4.0
LSD (a) 5%		2.7

*Used at rate of 2 pounds per 100 gallons of water.

contents, according to S. G. Lehman of the University of North Carolina. When this occurs, the resultant condition is commonly called boll rot. When healthy bolls crack at the tips in the early stages of boll opening, these microorganisms frequently enter through the cracks. If this occurs during a prolonged period of rainy weather, the microorganisms grow in the moist contents of the invaded locks. The lint and seed become discolored and bound together so that the lint cannot fluff out properly when the boll finally opens. This condition has been referred to as "tight lock." Such cotton is usually left in the field at picking time and constitutes a considerable loss.

Except for an occasional year when exceptionally dry weather prevails during the period of boll opening, considerable amounts of boll rot and tight lock are seen every year in North Carolina. In some years a very high percentage of the bolls produced in some areas exhibit the tight lock condition. This occurred in 1949 and 1950 and stimulated requests that the possibilities of some preventive treatment be explored. Accordingly, dusting tests directed to possible control of the tight lock condition were conducted in two localities in North Carolina in 1951.

On a farm near Scotland Neck, Halifax County, three dust preparations, each containing toxaphene insecticide, CP-9 dust sticker, and pyrophyllite carrier, were used. In addition to these common ingredients, one dust contained tribasic copper sulfate, another, "Dithane Z-78." The third dust, used as a check, contained no fungicide. Beginning on July 20, when the advanced bolls were three-fourths grown, and continuing at weekly intervals, seven applications were made by power duster. Also, in a nearby area, dusts containing the same fungicides but no insecticide were applied on smaller plots by use of hand dusters.

The percentage of unopened diseased bolls was negligible at any time during the test. At the end of the season, results were taken by examination of 100 open bolls on each plot. A record was made of each boll, indicating whether it showed no damage, or had been damaged by insects only, fungi only, or both insects and fungi. Also, each boll was assessed to indicate whether 1, 2, 3, or 4 locks were damaged. Little rain and no prolonged periods of wet weather favorable to tight lock development occurred during the period of boll opening. Insects had been well controlled by the grower before the initiation of this test.

In respect to damage by fungi alone or by both insects and fungi, no significant differences were found between treatments with insecticide only and treatments with both insecticide and fungicide. Nor was there any significant difference between plots receiving neither insecticide nor fungicide and those receiving only fungicide. The mean percentage of bolls damaged was 8.3 on plots with no fungicide, 12.0 for

(*Turn to Page* 115)

Reports How USDA Surveys are Made

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is connected with the Division of Insect Detection and Identification, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the United States.

By Kelvin Dorward

IN the September 1951 issue of *Agricultural Chemicals* the Cooperative Economic Insect Reporting program was explained. As reported at that time, the program was developed for the purpose of furnishing current information regarding the occurrence, distribution, and abundance of insect pests of importance to American agriculture in order to provide a basis for the proper application of control measures to insure production of food, fiber and other crops. The primary source of the information on insect conditions is from voluntary contributions of industry, private, State and Federal entomologists. On a national level, the information is compiled by the Bureau of Entomology and Plant Quarantine and released in the "Cooperative Economic Insect Report" issued weekly.

In order to help develop and guide this cooperative undertaking the American Association of Economic Entomologists appointed a survey committee consisting of George C. Decker, Illinois Natural History Survey, chairman, representing Experiment Stations; H. M. Armitage, California Department of Agriculture, representing State Regulatory Agencies; Lea S. Hitchner National Agricultural Chemicals Association, representing industry; W. C. Nettles, Extension Entomologist, South Carolina, representing extension entomologists; Roy G. Richmond, Regional Director, representing the Bureau of Entomology and Plant Quarantine; and Kelvin Dorward, ex-officio representing the Bureau's Detection and Reporting program. In a meeting of the committee in June, 1952 one of the recommendations was that every attempt possible be made to establish uniform thinking in the observation and reporting on insects. It was recommended that established survey methods be released in the "Cooperative Economic Insect Report" and that entomologists be encouraged to develop uniform methods of survey on other insects.

The series on survey methods began in the October 17, 1952 issue of the Report. It is recognized that adaptations must be made for varying conditions, but the underlying principle of applying uniform practices for determining insect conditions can be applied to most insects. Sur-

Table I

Classification	Number of bugs per square foot	Rating
Non-economic	0 - 250	1
Light	250 - 500	2
Moderate	500 - 1,000	3
Severe	1,000 - 2,000	4
Very Severe	2,000 or more	5

vey methods applied to the chinch bug and the European corn borer are outlined briefly in this column as examples of established procedures.

The chinch bug survey is conducted annually in several central states and in general the following procedure is used: The work is conducted during November and December in areas suspected of harboring infestations. Overwintering occurs in several species of bunchgrasses, including little bluestem, big bluestem, and broomsedge. Five samples of bunchgrass are collected at widely separated points in each county surveyed. Each sample consists of a bunch of grass including the crown, from 3.5 to 4.5 inches in diameter, which is cut from the sod clump with a tilling spade. After trimming, the sample is placed in a double paper bag on which the location, date, and other pertinent details are recorded. By examining samples of the grass clumps in the laboratory, hibernating bugs are detected and abundance determined. As counts are made, the number of bugs in the sample is converted to a number per square foot and rated as noted in Table I.

A rating is assigned to each county based on stop ratings and percentage of land under cultivation in the county. The greater the percentage of cultivated land, the less protective cover available for hibernation and, consequently, a reduced population in comparison to crops that may be attacked.

Three surveys are quite often conducted with relation to the European corn borer, each for a different purpose. These include the fall abundance survey, the distribution survey, and the service survey. The *fall abundance survey* is made to determine the potential overwintering population. Ten observations or sample counts are usually made in each county, but if it is found that contiguous counties cannot be sampled utilizing 10 counts per county, a survey on a district basis is preferred which averages about 5 counts per county. Fewer than 5 counts per county is not recommended.

The locations of the sampling points are distributed uniformly by marking them on a map of the area to be surveyed. The observer is instructed to proceed to the point marked on the map and sample the first corn field encountered. The sample is obtained after walking 50 paces into the field from the most accessible point.

Distribution surveys are made to search for new infestations and are less formal than the abundance survey. In this survey it is recommended that as many examinations as possible be made in fields deemed most likely to harbor the borer. For example, mid-season surveys should be made in earliest fields in the area under observation, and surveys in September or later should be confined to late fields. Concentrations of borers, if present, are expected to be more abundant in the respective types of fields.

Service surveys are made to determine the need for control and should be organized so that observations can be made by state zones (corn testing districts, crop reporting districts, etc.) or at strategic points in the state. Observations to be made include periodic counts on development of the borer as it changes from a dormant condition to an active one and larvae change to the pupal stage. The emergence of moths is used as a criterion of the probable time of the beginning of egg deposition which is the beginning of the critical period in corn borer control. Sufficent plants are examined in a number of localities to determine the egg load. When the egg load approaches 50 masses per 100 plants, on corn approximately 35 inches in extended leaf height in any locality, the situation is considered serious enough to advise treatment of similar fields with insecticides.

Similar observations are made on the progress of the development of the second generation borer in the more advanced corn, but treatment is not recommended until the egg load approaches 100 masses per 100 plants. The same rule is also applied to mid-season or late corn.

Other survey methods which have been reported on to date include those on pea weevil, spittlebug, cherry fruit fly, Mexican fruit fly, and grasshoppers. During the coming season, reports will be included on methods used in the surveying for such other insects as white fringed beetle, pink bollworm, sweet potato weevil, pea aphid, potato and tomato psyllid, horn worms, tobacco insects, golden nematode, gladiola thrips, and alfalfa weevil.★★

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FMC Ups Kudlich

Donald U. Kudlich has been appointed manufacturing coordinator for the machinery divisions of Food Machinery and Chemical Corporation, the firm has announced.

Mr. Kudlich joined Food Machinery nearly two years ago as a management staff member in the company's defense production program for manufacturing military vehicles. Prior to that time, he was associated with Wright Aeronautical Corporation as manufacturing manager. Mr. Kudlich will make his headquarters at San Jose.

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Kontz to Davidson-Kennedy

Ernest C. Kontz has been appointed Chief Sales Engineer of Davidson-Kennedy Company, Atlanta, manufacturers of fertilizer machinery. In his new position, Mr. Kontz will head the sales and engineering departments and coordinate the activities of the two.

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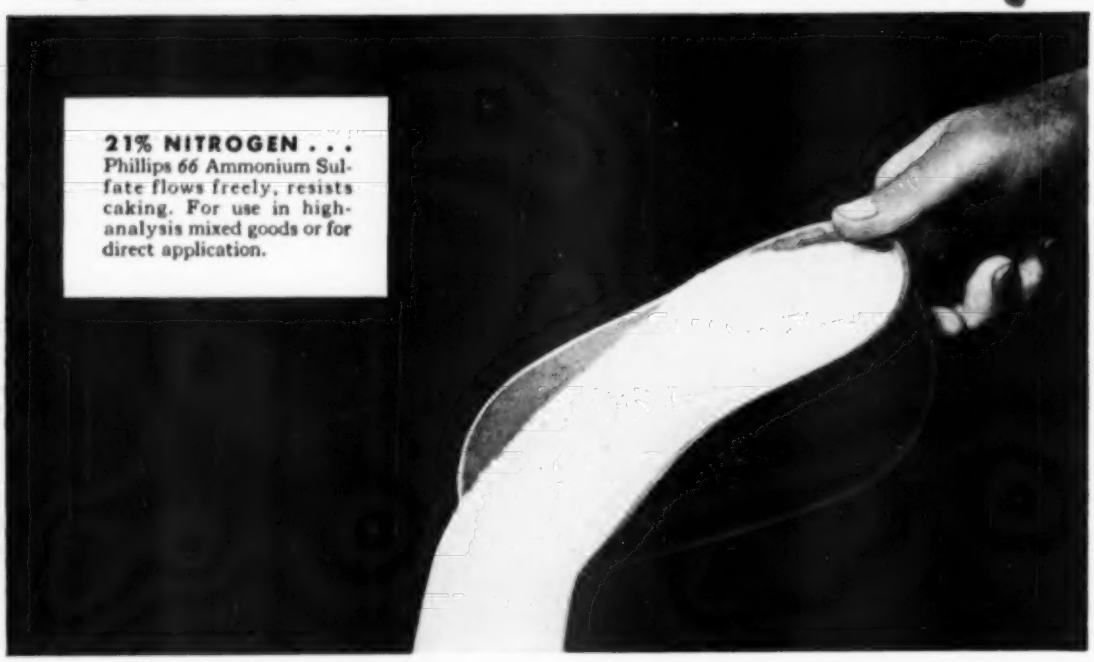

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Suppliers' Bulletins

List Pesticide Advances

Research Information Service, 53 Nassau St., New York, has issued the third in a series of bulletins listing translations of reports on insecticides, pesticides, fungicides and weed killers. Bulletin #73 consists of English translations of recent patent applications and research papers from the western and eastern zones of Germany and Austria.

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Bag-Closing Information

Richardson Scale Company, Clifton, N. J. offers a new four-page two-color bulletin on its specially-designed V-belt conveyor for transporting bags from filling and weighing equipment through bag-closing operations.

Including photographs and engineers' drawings, the V-Belt Bag-Sewing conveyor bulletin covers operating details, capacities, and special features of the conveyor. Detailed information is given on drive motor, bag-actuated limit switch, frame construction, pulley scraper, guide rails, and height adjustment.

Also given is information on the Richardson two-headed sewing pedestal for bag-closing.

For copies of the bulletin—(No. 0152) write to the Richardson Scale Company, Clifton, N. J. A corollary bulletin on the Two-Headed Sewing Pedestal — (Bulletin No. 5201)—also is available upon request, the company states.

•

Acid Resistant Conveyor

A bucket elevator chain for handling fertilizer materials and other chemicals has been developed by Beaumont Birch Co., Philadelphia. Sold under the trade name of "Dura-Tred," the chain is constructed of metal said to be more resistant to the corrosive action of chemicals than either cast steel or malleable iron.

Because of this feature, the product is said to give longer service life than conventional chains when used for handling fertilizers and other bulk chemicals. Thickness of the metal in the link barrel has been increased over 300% wherever wear normally occurs from contact between moving parts, the makers state.

Further information is available from the Beaumont Birch Co., Chemical Handling Division, 1505 Race St., Philadelphia, Pa.

•

Sulfuric Mfgr. Booklet

Reduction of impurities in sulfur used to produce sulfuric acid is the subject of an eight-page bulletin issued by Niagara Filter Corp. Containing information on problems of the sulfuric acid producer as well as illustrations showing a number of typical installations, the booklet is available from Niagara Filter Corp., 3080 Main St., Buffalo 14, N. Y.

•

Vibrating Screen Offered

A new high-speed vibrating screen, designed by Universal Vibrating Screen Co., Racine, Wisconsin, is being offered to the chemical specialty trade. Called the new "Uniflex 24" x 36" screen, it is adaptable to a wide variety of screening operations, according to the makers. The machine is offered in single, or double deck, open or closed construction. A standard unit, weighing 150 pounds, is equipped with feed pan and discharge chute arranged for either floor mounting or aerial suspension. Power is supplied by a 1/3 HP motor, or by a gasoline engine drive. Bulletin No. 65 gives full description. It is available from the company.

•

Trace Element Bulletin

Technical bulletin No. 106 has been issued by Ferro Corporation, Cleveland, describing its product "F.T.E." (Fritted Trace Elements) which contains manganese, iron, zinc, copper, boron and molybdenum as a supplement to the three chief elements of plant food, nitrogen, phosphorus and potassium. The bulletin, complete with illustrations, tells the story of the slowly-soluble trace elements which, the makers state, provide a constant source of trace elements by remaining in the soil regardless of leaching and soil acidity. "No matter how much water passes through the soil, the . . . elements 'stay put'," the makers state.

Copies of the bulletin are available from the company, Ferro Corporation, 4150 E. 56th Street, Cleveland, 5, Ohio.

•

Safety Brochure Offered

Willson Products, Inc., Reading, Pa. has issued an attention-compelling brochure emphasizing safety in the use of various pesticides. Captioned "Kill the bugs—not yourself," it suggests the use of masks, protective clothing, caps and gloves. Printed in color on a cardboard 11 x 17 in size, the piece is intended to be placed in retail outlets where buyers of pesticides may see it. For further information, address the Agricultural Department, Willson Products, Inc., Reading, Pa.

•

Emulsifier Bulletin Out

Ninol Laboratories, Chicago, has announced the addition of two new products to their series of "Toximul" emulsifiers.

"Toximuls" 300 and 400 are both anionic type emulsifying agents designed to cover a broad range of chlorinated toxicants between them. Thus "Toximul 300" is recommended for toxaphene, chlordane, DDT, 2, 4-D and aldrin, while "Toximul 400" is used for BHC, lindane, dieldrin, parathion and 2, 4, 5-T.

Outstanding features imparted by these two new emulsifiers are flash dispersibility when poured into water, slow creaming rates, and unusually low cost, the makers state. Copies of Bulletin A-2 are available on request from the company, 1719 S. Clinton St., Chicago 16, Ill.

Technical Briefs

Test Orange Drop Sprays

Results of test spraying of orange groves with late fall and winter applications of 2,4-D to prevent premature drop were announced recently by Louis C. Erickson, University of California College of Agriculture, Redlands, Calif. Mean reduction in drop of sound fruit for all times of spraying was 70.7%. In making the tests, consideration was given to the fact that a large proportion of citrus fruit that drops is not marketable. Thus total fruit drop counts are not necessarily a critical measure of the effectiveness of spraying. According to Mr. Erickson, sound Washington navel orange fruit was the only type in which the drop was reduced consistently by a highly significant amount.

•

Control Holly Leaf Miner

Two successful methods for controlling the holly leaf miner have resulted from research conducted during the past summer at the Connecticut Agricultural Experiment Station, New Haven. Sprays of DDT or dieldrin, put on before the adult miner emerged in late May, and followed by additional applications in June, gave excellent control. So did mid-summer treatments of lindane or aldrin, applied to trees where the miners were already feeding. The holly leaf miner is one of the most destructive insect pests attacking this ornamental plant. Research on this problem in the Connecticut Station has been carried out under the direction of John C. Schread, entomologist.

•

Dieldrin for Citrus Pest

Dieldrin, has been approved recently for control of Argentine ant on citrus in California. Reports received from the University of California, Riverside Experiment Station indicated that dieldrin gives outstanding control of this pest, and is the first insecticide to prove satisfactory for controlling both the Argentine ant and citrus thrips. Dieldrin was recently accepted for registration for control of citrus thrips by the United States Department of Agriculture.

The Argentine ant aids in the distribution of aphids, mealybugs and scale insects, all injurious pests of citrus. Dieldrin, as recommended, not only controls the ants but also does not reduce beneficial insect populations to the extent where cottony cushion and soft brown scale can increase, according to data released to date.

•

Baits for Dairy Flies

Use of chemical baits for the control of insecticide-resistant houseflies has shown promise in experiments at the U.S.D.A. Bureau of Entomology and Plant Quarantine experiment station at Orlando, Florida. Used in the tests with baits were several chemical compounds, including TEPP, sodium fluoro acetate, sodium arsenate and sodium arsenite.

Although considered promising, the U.S.D.A. has emphasized that this method is not yet recommended for general use since all the materials used are of highly toxic nature and further investigations concerned with their safe use must be made.

Combining these insecticides with blackstrap molasses or brewers' malt gave good control in field tests in Florida dairies. Such chemical baits were set in pans in several dairies. In others, floors of the dairy barns were sprinkled with solutions of TEPP, blackstrap molasses and water. The pan method provided a higher degree of control over a much longer period of time and required fewer applications, it was found. Equipment required for either type needs little maintenance and is initially cheap, it was pointed out.

Flies in the vicinity of Orlando, where the tests were made, had developed such a high degree of resistance to all the chlorinated insecticides that by 1951, none of these materials gave satisfactory control as residual treatments nor as space sprays. It was in the fall of that year that tests with baits were begun.

Laboratory tests showed that TEPP, sodium fluoro acetate, sodium arsenate, and sodium arsenite at concentrations of 0.5 percent or less, produced 84 to 100 percent control in 48 hours. A 0.2 percent concentration of TEPP gave 100 percent kill. Brewers' malt and blackstrap molasses proved to be best attractants for the fly baits.

In three dairies, baits of sodium arsenate mixed with water and blackstrap molasses or malt were placed in open metal pans and set about the floors of the dairy barns. Course wire covers prevented dairy animals from sampling the poisoned bait. The pan baits gave 49 to 88 percent control during the first 24 hours they were used, and control gradually increased to 90 percent or more during the second or third week of the tests.

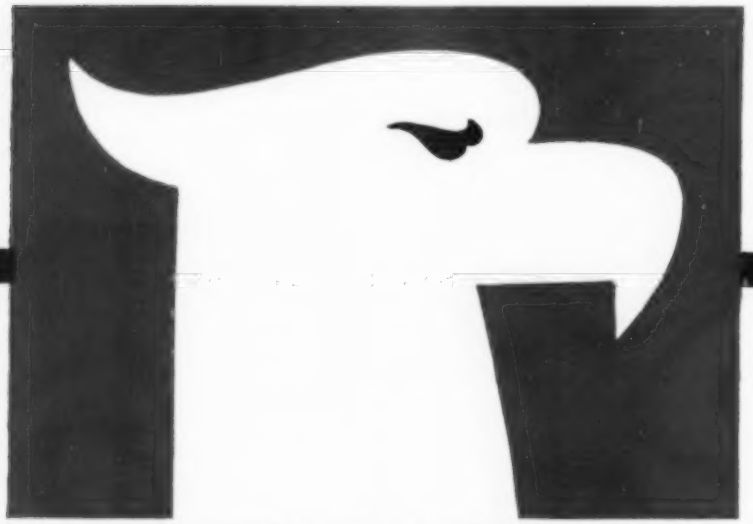
In other dairies, baits were applied with an ordinary garden sprinkling can on the floors in places where flies congregated. Some dairies were treated with water solutions of 0.05 percent TEPP mixed with blackstrap molasses. The same solution with 0.3 percent lindane added was used in other dairies. Repeated applications of these baits produced a high degree of control.

•

Red Mites Favor Potassium

In a series of experiments conducted recently at the Connecticut Agricultural Experiment Station, New Haven, by Dr. Philip Garman, red mites were found to increase substantially in numbers when fertilizers containing potassium were put on plants. On beans in greenhouse trials potassium was tested in various forms —nitrate, chloride and sulfate—all with the same result. When calcium nitrate was applied, however, following the potassium applications, the

(*Turn to Page* 101)



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INDUSTRY NEWS

U. S. Potash Elects Ford

J. B. FORD JR.

Jay B. Ford, Jr., has been appointed assistant general manager of the United States Potash Company according to Horace M. Albright, president and general manager, speaking for the board of directors of the company. The appointment was effective as of December 15th.

Mr. Ford, thirty-one, has been with the company since 1947, and assistant treasurer since August, 1950. He was graduated from Stanford University in 1943 and from the Harvard Graduate School of Business Administration in 1947. He served for three years in the Quartermaster Corps of the United States army, with most of his service in Europe. He was a captain at the time of his release from active duty.

•

Ethyl Corp. Names Barton

The appointment of Richard H. Barton as Ethyl Corp. chemical sales representative in the southeastern states has been announced by Malcolm P. Murdock, general sales manager. Mr. Barton, who recently joined Ethyl after three years as agricultural chemical sales manager for Innis, Speiden and Co., will make Atlanta, Ga., his headquarters.

To expand Ethyl's sales activities further in the agricultural chemicals field, Mr. Murdock also announced that two intra-company transfers have been made.

Bruce Crane, who joined Ethyl in 1933, is being assigned a midwestern chemical sales territory, with headquarters at Chicago, and Paul R. Harris, who has served as Ethyl safety engineer at Seattle since joining the company in 1944, will now be responsible for West Coast chemical sales. He will make San Francisco his headquarters.

Ethyl Corp. is now a major producer of high gamma BHC and benzene hexachloride (technical) and is completing a plant to produce lindane. In addition to these insecticides, the company recently announced the availability of 2,4,5,-trichlorophenoxyacetic acid, brush killer and herbicide when formulated into ester, amine or sodium salt. The company expects also to offer in commercial quantities a finished herbicide —a low volatile 2,4,5-T ester—early in 1953.

•

Davies Builds in N. J.

Davies Nitrate Co., Inc., has started construction of a new laboratory and factory office building at its plant near Metuchen, New Jersey. This will house enlarged facilities for its research and development program under the direction of Mason P. Pearsall.

In addition to its work with inorganic nitrate and related products, the company is studying several chemicals in the organic field. The main office of the company is at 114 Liberty St., New York, N.Y.

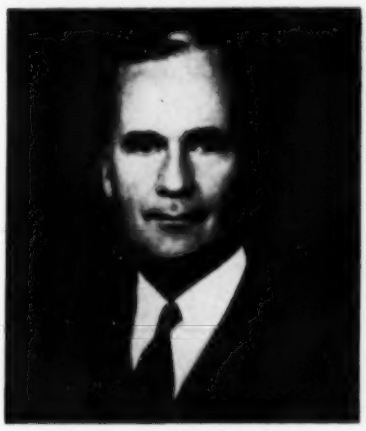
•

New Mexican Plant Opens

Stauffer Chemical Co. has opened its new pesticide plant in Mexico, the company has announced. Located at Nogales, Sonora, which is served by both rail and truck lines which service the farming lands in the area, the location is said to be advantageous for the manufacture of pesticides.

Although the Nogales plant is the first Stauffer plant in the country, the company has been supplying various pesticides in Mexico for some time.

New FMC Vice-President



DR. M. E. BRETSCHGER

Dr. Max E. Bretschger, head of Food Machinery and Chemical Corp's. Buffalo Electro-Chemical Company Division of Buffalo, New York, has been elected a vice-president of the parent firm. The move was made at a directors' meeting in San Jose, December 9.

Dr. Bretschger's election to FMC vice-president followed his recent promotion to president of Buffalo Electro-Chemical Company, succeeding the late Charles A. Buerk. Prior to that time, Dr. Bretschger was vice-president of the Buffalo company, a major producer of hydrogen peroxide and other active oxygen compounds.

Dr. Bretschger began his career with Buffalo Electro-Chemical in 1926. A native of Switzerland, much of his broad background of experience was gained in Europe where, following his education in Zurich, he held prominent positions in chemical industries in Italy, Germany, and Switzerland.

•

Francis Joins Amer. Potash

American Potash & Chemical Corp., Los Angeles, Calif., has announced the appointment of William J. F. Francis as western general sales manager. He succeeds David B. Scott, who recently retired after 18 years of service at the post.

Mr. Francis comes to American Potash from Pennsylvania Salt Mfg. Co., where he was manager of the agricultural chemicals division and general sales manager of the special chemicals division. Before his Pennsalt connection, Mr. Francis was district sales manager of California Spray Chemical Corp.

2 Join Thompson-Hayward

LITTLE STRIPLING

Thompson-Hayward Chemical Company, Kansas City, Mo., has announced the appointment of two new sales representatives for Texas. They are Max Stripling of Mineral Wells, Texas, a University of Texas graduate, who recently opened the Lubbock warehouse and will serve West Texas from there; and Bruce Little of Morrilton, Arkansas, who formerly represented the company at Little Rock. Mr. Little has recently returned from a tour of duty with the U. S. Navy and will work out of the company's Dallas office. Both men will emphasize agricultural division sales.

•

J-M Personnel Shifts

Johns-Manville Corporation's Celite Division has announced recent personnel changes effective January 1. R. J. Amberg has become Cleveland District sales manager; S. S. Childs, comptroller of the Celite Division; Carl Dietz, New York District sales manager; P. A. Martinson has been transferred to New York as product manager for fillers; and W. J. Peterson, production engineer, with headquarters in New York.

•

Midwest Shade Conference

The 8th annual meeting of the Midwestern Chapter of the National Shade Tree Conference will be held February 11-13 at the Cosmopolitan Hotel, Denver, Colo., according to an announcement by Noel B. Wysong, River Forest, Ill., secretary of the group. More than 300 are expected to attend the conference.

Among papers to be presented are a number covering pest control. Carl E. Seliskar, Colorado A. & M. College, Ft. Collins, will talk on "Shade Tree Diseases"; George M. List, Colorado A. & M., "Some Insect Pests of the Rocky Mountain Region"; Ernie Herrbach, horticulturist, Chicago, Ill., "Sap-Sucking Insect Pests of Ornamentals"; Thomas L. Martin, Brigham Young University, Provo, Utah, "Soil and the Microbe"; and J. C. Carter, plant pathologist, Illinois Natural History Survey, Urbana, Ill., "Field Diagnosis of Tree Troubles."

Following the presentation of each paper, there will be a short discussion period. Additional opportunity for questions, answers and discussion will be provided in a "plant clinic" and a "Stump the Experts" session.

•

Cyanamid Names New V-P

Election of William R. Geddes as vice-president of North American Cyanamid Limited has been announced by K. C. Towe, president of North American Cyanamid Co. Mr. Geddes was assistant to the president of NACL until his recent advancement. He is also president of Chemical Construction (Inter-American) Limited. Both firms are Canadian associates of American Cyanamid Company.

Prior to joining NACL in January, 1948, Mr. Geddes was connected with Milton Hersey, Ltd., of Montreal for many years. At the outbreak of World War II he served the Canadian government as a member of the Foreign Exchange Control Board and Price and Trade Board in Ottawa. He was deputy chairman of the latter, in charge of war-time civilian supplies.

•

Mo. Hort. Society Meets

The annual meeting of the Missouri State Horticultural Society was to be held at the Daniel Boone Hotel, Columbia, Mo., January 5 and 6, acording to an announcement made by the group. The program was to include talks on weed control in horticultural crops, virus diseases in fruit plants, and a panel discussing the 1953 spray program for the state. Taking part in the latter panel was Howard Baker, U.S.D.A., Washington, D.C.; Lee Jenkins, H. G. Swathwout and George Thomas.

To H. J. Baker & Bro.

Wm. E. MERRITT

William E. Merritt has joined H. J. Baker & Bro., New York, as of January 1, the company has announced. Mr. Merritt, for the past seven years with Ashcraft-Wilkinson Co., Atlanta, Ga., is a native of Tennessee, was graduated from the University of Georgia in 1938 and later gained a Masters Degree in Business Administration from Harvard University where he majored in marketing and sales management.

During his service with Ashcraft-Wilkinson, Mr. Merritt established and operated the industrial chemical department. He was in charge of both purchasing and sales for all industrial chemicals and expanded the scope of these activities to include agricultural chemicals.

•

Two Join Mathieson Co.

Dr. Robert C. Haring and Marvin J. Hall have joined the research department of Mathieson Development Company, Division of Mathieson Chemical Corporation.

Dr. Haring, who holds degrees from the University of Washington and the University of Wisconsin, was formerly director of the John Powell Laboratories, Inc., Port Jefferson, New York. From 1933 to 1946 he was with the National Aniline Division, Allied Chemical and Dye Corporation, Buffalo, N.Y.

Dr. Hall, with degrees from Midland College, Fremont, Nebraska, and the University of Nebraska, was associate director of research and development for Lever Brothers Co., New York, N.Y., prior to joining Mathieson. From 1946 to 1949 he was director of research for Kraft Foods Co., Chicago, Ill., and prior to that was with Bauer & Black, Chicago, Ill.

Appointed by A & S

JOHN K. McINTYRE

John K. McIntyre has been appointed sales representative in the Western Division of Arkell and Smiths, manufacturer of paper bags. Mr. McIntyre will work out of the company's Kansas City office.

•

Naugatuck Appoints Three

Two new technical sales representatives have been appointed to the agricultural chemicals sales department of the Naugatuck Chemical Division, United States Rubber Company, according to T. W. Brasfield, sales manager.

Warren R. Newall has been appointed to the Pacific-Northwest area, and will make his headquarters in Portland, Oregon, at the U.S. Rubber office, 630 W. Tenth St. This is a reassignment for Mr. Newall, who was formerly in Naugatuck Chemical's research and development department at Riverside, California.

F. W. Herr has been assigned to the Great Lakes area, and will make his headquarters in Cincinnati, Ohio, at the U.S. Rubber office, 1101 Central Parkway. Mr. Herr was formerly with the Thompson-Hayward Chemical Company, New Orleans, Louisiana.

The company has also announced the appointment of Felton Byrd as technical field representative for the agricultural chemicals department. Mr. Byrd has been assigned to the south and southwest areas, and is making his headquarters in the U.S. Rubber office at Dallas, Texas. He is a graduate of Mississippi State College, and was formerly employed by Aero Chemical Industries, Kansas City, Missouri.

•

Bemis Shifts Personnel

With 44 years of company service to his credit, E. H. Howell retired on January 1, as manager of the Bemis Bro. Bag Co. plant at St. Louis. He will be succeeded as manager by P. C. McGrath, formerly assistant manager.

Mr. Howell started his career with Bemis in 1908 as a salesman at St. Louis. He was named sales manager in 1921, and became manager in 1938. Mr. McGrath joined the Bemis organization at St. Louis in 1913, and in 1921 was made assistant sales manager. He was appointed sales manager in 1938 and assistant manager in 1952.

A. J. Grunzinger, formerly assistant sales manager, has been named sales manager to replace Mr. McGrath.

E. H. HOWELL P. C. McGRATH

New Urea Plant for Nitrogen Division

NITROGEN Division, Allied Chemical & Dye Corporation, has announced plans for urea products expansion at its South Point, Ohio, plant. The project, involving expenditure of more than $4,000,000, includes doubling of the plant's urea synthesis capacity, together with installation of facilities to produce a pebbled urea fertilizer compound and an improved urea cattle feed compound. Construction was expected to start shortly after the first of the year, with the work completed early in 1954.

Doubling of urea synthesis capacity will be effected through modification of present South Point plant to a new process, the company says. The new process developed by Nitrogen Division is said to be more efficient and capable of producing urea of exceptionally high purity.

The new production of urea will be made available as a pebbled, kaolin-coated fertilizer compound containing 44% plant food nitrogen. The product will be free flowing with good storage properties, easily handled in fertilizer distributing equipment and ideally suited for direct application to growing crops. Since urea is the most concentrated solid nitrogen fertilizer material, its consumption results in reduced requirements for transportation equipment and lower application costs to the farmer per unit of plant food.

Nitrogen Division officials pointed out that the urea expansion program for South Point, Ohio, will represent an important step in Division's forward program by making available to American farmers additional supplies of high concentration nitrogen products and fertilizers of the type and form advocated by leading State and Federal agronomists. Other steps in this program were indicated to include increases in ammonia capacity now nearing completion at Hopewell, Virginia, and South Point, Ohio; and new plants now under construction for production of ammonia and urea near Omaha, Nebraska, and nitrophosphate high analysis fertilizer at South Point, Ohio.

Research and pilot plant work on urea synthesis and end-products to be used by Nitrogen Division was done by Division's Development Department at Hopewell, Virginia, working in cooperation with South Point production personnel. In urea synthesis process, by-product carbon dioxide recovered from ammonia synthesis gas will be purified, compressed, mixed with anhydrous ammonia, and passed through a series of autoclaves to form urea. Since urea synthesis presents serious problems of possible equipment failure and corrosion, a considerable portion of Nitrogen Division's research effort on the project has been directed to development of suitable construction materials and substitutes for alloys vitally needed for other defense uses.

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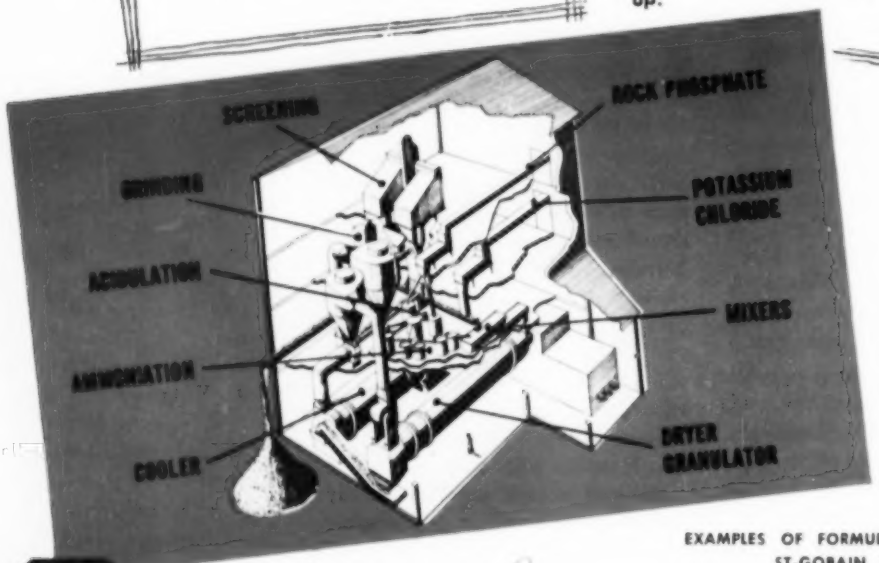

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10	10	17	(sulfo-nitric acidulation)
11	11	11	" " "
10	15	20	(phospho-nitric acidulation)
12	15	18	" " "
12	12	20	" " "
14	14	14	" " "
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AGENTS FOR ST-GOBAIN PROCESS

CSMA Discusses Applications, Labels, Other Problems at New York Meeting

WITH an attendance of some 700 persons, the Chemical Specialties Manufacturer's Association held its 39th annual convention at the Hotel New Yorker, New York City, December 7 & 8. The group re-elected its officers for another year.

A symposium on "Fog Machines for Dispensing Insecticides," with E. J. Campau, Standard Oil Co., as moderator, brought out a considerable amount of information on the problem of application. A. H. Yeomans, U. S. D. A., Bureau of Entomology & Plant Quarantine, Beltsville, Md., described various types of fogging devices now on the market including the steam, thermal and centripetal types. He also discussed gaskets, filters and other machine parts and the output of each type. W. B. Stevens, Socony-Vacuum Co., New York, discussed different types of insecticidal materials used in fogging machines and described the outdoor and indoor types of oils used for fogging. Dr. J. V. Osmun, Department of Entomology, Purdue University, Lafayette, Ind., demonstrated the scope of use of the fogging devices and summarized by stating that "as the wind goes, so goes the fog." Dr. E. J. Hansens, Department of Entomology, Rutgers University, New Brunswick, N. J. described the New Jersey fly and mosquito control program and the place of fogging in the program. He concluded that fogging played an important role in control programs. The final speaker on the program was F. K. Harder, Harder Exterminating Co., Hempstead, Long Island, who discussed the practical uses of fogging and results of actual experience in the field.

Another symposium, moderated by G. S. McInerny, Boyle-Midway, Inc., New York City, concerned the way various people look at labeling. The first speaker, S. C. Billings, U. S. D. A., Washington D. C. described the way the Department of Agriculture looks at labels and discussed labeling as regulated by Federal law. The second speaker, E. W. Constable, state chemist, department of agriculture, Raleigh, N. C. described the labeling subject from the viewpoint of a state control official. He mentioned that control officials worked closely to the Federal law and went into details of cases of mislabeling of products, including fertilizer diluted with common salt and hog feed given bulk with clay. The third speaker, Sanford J. Hill, E. I. DuPont de Nemours & Co., Wilmington, described the technical man's approach to the problem and emphasized the necessity for understanding all the labeling laws, Federal and State and realizing when products overlap into other fields such as the food & drug acts, caustic poison act, or livestock remedy act. N. M. Walker, Pennsylvania Salt Mfg. Co., Philadelphia, demonstrated by slides the various types of labeling requirements and type size specifications, pointing out the difficulty in meeting all requirements while at the same time trying to make an attractive label for the package.

The final speaker was John Conner, Washington, D. C. who pointed out the legal responsibilities of making claims on labels. He mentioned that a warranty on a label is a vehicle to establish a relationship between the manufacturer and the ultimate consumer. He also pointed out that advertising claims and labeling must be correlated and must not be contradictory.

Among the other speakers on the program were Karl Paul Link, University of Wisconsin, Madison, who reviewed briefly the evolution of warfarin rodenticides. Ray L. Cuff, National Livestock Loss Prevention Board, Kansas City, Mo., reviewed various types of livestock sprays, emphasizing the economic gains to be realized from spraying programs.

•

DuPont Personnel Changes

Two new appointments have been announced by the Du Pont Company to its Grasselli Chemical Department's agricultural product development section. The new men are Robert Sutton, transferred to the development section from the technical division, and Darrell C. Drake, who has recently completed work for his Ph.D. degree in entomology at the University of Wisconsin.

For the past year, Mr. Sutton was stationed at the Grasselli experimental farm near Raleigh, N. C., working on herbicides and insecticides. He earned his B.A. degree at Colorado College, and his M.S. in entomology at Cornell University and has been with Du Pont for 11 years.

Dr. Drake, a Wisconsonite, joined Du Pont in October. He has been assigned to the staff of Grasselli's product development section experimental farm near San Jose, Calif., and will assist in insecticide, herbicide, and fungicide field evaluations on the West Coast.

The company has also announced three personnel transfers. David A. Carlson, an Iowa State College graduate with B.S. degree in agronomy and entomology, has been moved from the Wilmington office to the San Antonio, Texas, field station; Dr. Lyall F. Taylor, entomologist from the University of Wisconsin, has moved from the San Jose farm to the field station at Corvallis, Ore.; and Donald L. Burgoyne, Iowa State graduate with a degree in plant physiology, has been transferred from the Wilmington office to the San Jose farm.

•

New IMC Potash Facility

Construction was expected soon to get under way on a new addition to the sulfate of potash facilities of International Minerals & Chemical Corp., at Carlsbad, N. M., the firm has announced.

Sturtevant
Granulation Process
Overcomes Fertilizer Storage and Distribution Problems

At a recent U. S. D. A. Fertilizer Industry Advisory Committee meeting the following was emphasized in the statement "that year-round movement of fertilizer materials into the using areas for storage should be encouraged as a solution to storage and distribution problems."

Sturtevant fertilizer granulating units can help you provide the solution to the problem. This efficient, economical granulation equipment can be supplied for various hourly tonnages and certain granule sizes, depending on your particular requirements.

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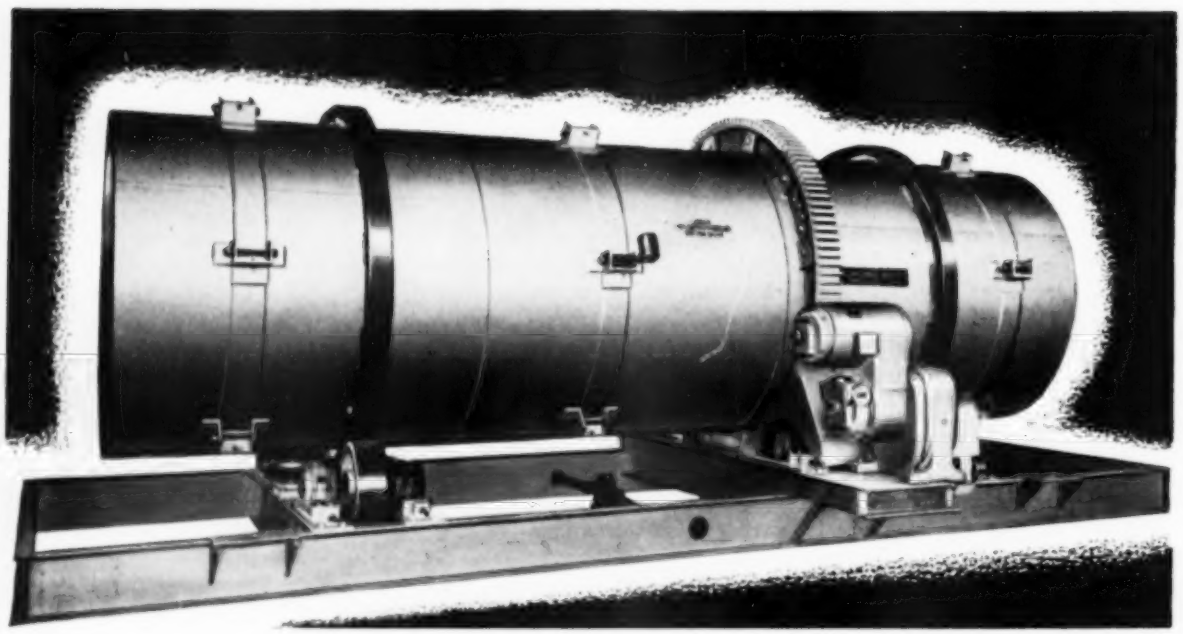

U. S. Regulations Changed

The U. S. Department of Agriculture has announced changes, effective January 19, 1953, in the regulations for the enforcement of the Federal Insecticide, Fungicide, and Rodenticide Act that will (1) establish a method for renewal of economic poison registrations under the Act, and (2) clarify provisions relating to permits for economic poisons for experimental work.

The changes are similar to those proposed by USDA on August 13. Interested persons were given through October 15 to file comments on the changes as proposed. Several changes requested in these comments have been made to clarify the intent of the regulations.

Changes in the enforcement regulations relating to renewal of registrations are in line with provisions of the Act authorizing cancellation of registrations at the end of a five-year period. The registration requirements as to rodenticides and herbicides became effective on December 25, 1947. The regulations being adopted provide that the USDA will notify each registrant of the end of the five-year period for the registration of a particular product. If the registrant desires continued registration, he should notify the USDA in writing and registration will be continued for another five years under the same terms as the original registration. This will provide an opportunity to review the labeling and bring it up-to-date with current available information. If no request is received for continued registration of a particular product, the registration will be cancelled.

Revisions in provisions relating to permits for shipment of economic poisons for experimental use detail more thoroughly the steps necesary to avoid hazards from the experiments. If the experiments involve use on food or feed, the food or feed must not be consumed except by experimental animals or there must be convincing evidence that the proposed use is safe. A statement of the principal ingredients will be required on labels of economic poisons under permit for experimental purposes if they are sold.

Other changes relate to the data which must be provided in an application for experimental permit and to the labeling on economic poisons in an experimental status. No permit is required for shipment of an economic poison for experimental research on economic poisons.

The Federal Insecticide, Fungicide, and Rodenticide Act regulates the interstate marketing of economic poisons. In the operation of the Act, more than 45,000 economic poisons have been registered, helping to assure that the proper label information appears on the products. Experimental permits are issued on new products and also on new uses of old products. These permits control the distribution of the products and allow adequate testing to determine effectiveness.

•

Kansas Group Elects

Earl Stoughton, Hutchinson, Kansas, was elected president of the Kansas State Horticultural Society at the group's recent annual meeting at Hutchinson. Other officers named were: Norris Rees, Topeka, vice-president; Frank Clark, Coffeyville, treasurer and Herbert L. Drake, Bethel, secretary. The new president succeeds William G. Amstein of Manhattan.

•

Research Chapter Started

A charter for the Midwest Research Institute Branch of the Scientific Research Society of America was presented December 9 at Kansas City Mo. Installation of the chapter, one of 24 in the U. S., was made by Dr. D. B. Prentice, director of the national society, founded in 1947 under auspices of Sigma Xi.

•

Fertilizer Blast in Japan

At least fifteen persons were killed in the explosion of a fertilizer plant in Nagoya, Japan December 22, it has been reported in the U. S. The explosion, destroying a new ferro-concrete building that housed part of the company's ammonium sulfate plant, is thought to have been touched off by a spark in a hydrogen tank where ammonium sulfate is extracted.

Ups "Crag 341" Production

A 250 per cent increase in the production of "Crag Fruit Fungicide 341" for the 1953 growing season has been announced by Carbide and Carbon Chemicals Company, a division of Union Carbide and Carbon Corporation. During 1952, the spray material was in short supply. It is used primarily for the control of apple scab and cherry leaf spot.

"Crag 341," a glyoxalidine fungicide, was developed by Carbide's fellowship at Boyce Thompson Institute, Yonkers, New York, and first field-tested at Pennsylvania State College. It is now recommended in practically all the states where apple scab and cherry leaf spot are major problems.

•

Ala. Short Course for Feb.

The fourth annual Alabama pesticide short course will be held at Alabama Polytechnic Institute, Auburn, Ala. February 24 and 25, according to information from Dr. E. V. Smith, dean and director of the Alabama Agricultural Experiment Station, Auburn.

Normally attended by county agents, dealers, distributors, blenders and formulators of agricultural chemicals, as well as custom operators, the meeting is expected to attract a large registration.

•

Virden to Diamond Board

John C. Virden, Cleveland industrialist, has been elected a director of Diamond Alkali Company, Raymond F. Evans, president of Diamond, announced following a recent meeting of the board of directors.

Board chairman for the past 16 years of the electrical lighting fixture firm which bears his name—the John C. Virden Co.—he brings to Diamond a broad background in the fields of business and governmental administration.

•

Plans Big Spray Program

To control spruce budworm on $200 million worth of balsam fir timber in New Brunswick, one of the biggest aerial spraying jobs in history is being undertaken by Central Aircraft Co., Yakima, Washington. The

V-C BAGS

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CHEMICALS: Sulphuric Acid · Phosphorus · Phosphoric Acid · Ferrophosphorus · Sodium Phosphates · Sodium Silicates · Phosphorus Chlorides, Tetraethyl Pyrophosphate and other organic Phosphorus compounds.

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VIRGINIA-CAROLINA CHEMICAL CORPORATION

General Offices: 401 East Main Street, Richmond 8, Virginia

project, to involve the use of 75 airplanes over more than a million acres of forest, will cost $500,000 for application costs alone. DDT will be used for the work, according to A. L. Baxter, president of the company.

Last year, the firm sprayed 180,000 acres in the same area for a paper manufacturing firm. Several companies and Canadian Government agencies have joined in a non-profit organization to finance the million-acre spraying job, Mr. Baxter reports.

•

Ill. Spray School Held

Some 300 persons were expected to be present at the fifth Illinois Custom Spray Operators' training school scheduled for January 15 and 16 at the University of Illinois, Urbana. According to H. B. Petty, Illinois Natural History Survey, in charge of arrangements, the school was open to dealers and spray equipment suppliers, salesmen, manufacturers and others interested in agricultural chemicals, in addition to the custom operators themselves.

According to advance information, topics slated for discussion included control of weeds in corn, soybeans; insect pests affecting livestock and crops in Illinois; liquid fertilizer use; brush control and crop defoliants.

•

2 New Prentiss Products

Prentiss Drug & Chemical Company, New York, is now offering two new insecticide concentrates said to combine the effectiveness and safety of pyrethrum extract with the economy of certain synthetic chemicals of more toxic nature.

They are "Prentox Pyronyl 20 Concentrate," containing 0.5 grams pyrethrins and 4 grams piperonyl butoxide per 100 cubic centimeters, and "Prentox Pyronyl Roach Spray Concentrate," containing 1.2 grams pyrethrins and 6 grams piperonyl butoxide per 100 cubic centimeters.

"Prentox Pyronyl 20 Concentrate, at 5 percent (one part plus 19 parts of deodorized kerosene) is recommended as a space spray for use against flies, mosquitoes, gnats, wasps, moths and other flying insects and for direct spraying on spiders, ants, crickets, silverfish, etc. Applied as a surface spray at the rate of one pint per 380 square feet, "Prentox Pyronyl 20 Concentrate" is residually effective against many household pests.

"Prentox Pyronyl Roach Spray Concentrate," at a concentration of 7.5 percent (approximately one part plus 12 parts of deodorized kerosene) kills many crawling insects and related pests such as roaches, silverfish, spiders, ticks, ants, fleas, bed bugs, clothes moths and carpet beetles, as well as stored product pests including flour beetles, grain beetles, meal worm moths, weevils and many others, the makers state.

Swift Names Sanders, Bowers in New Posts

A. B. BOWERS

M. D. SANDERS

M. D. Sanders has been named as director of research in the Plant Food Division of Swift & Company, Chicago, to succeed the late Dr. H. B. Siems, the company has announced. C. T. Prindeville, vice-president, also announced that the functions of agronomist will be performed by A. H. Bowers.

Mr. Sanders has been with Swift for 27 years, except for 24 months during which he was with the armed forces in World War II. He is a native of Georgia, attended the University of Georgia and took up graduate studies at the University of Chicago and Illinois Tech in chemistry and chemical engineering.

Responsibilities being assumed by Mr. Sanders in his new post include general supervision of all research related to plant food, insecticides, fungicides and weed killers produced in 27 Swift factories around the country. In addition, he will have charge of all Swift plant food chemical control laboratories.

Mr. Bowers, agronomist, is a graduate of Pennsylvania State College, and holds a Master's degree in soil science from Michigan State College. In his new work he will work closely with governmental and industrial authorities on plant nutrition, crop production and soil management.

•

Louisiana Pest Group Meets

The third annual Louisiana Insect Control Conference was about to be held as this issue went to press. Scheduled for January 15 and 16, the sessions were to be held in the City Hall Auditorium, Shreveport, Louisiana for the two-day session, according to Kirby L. Cockerham, extension entomologist, Louisiana Agricultural Experment Station, Baton Rouge, La.

The program was expected to cover the complete insect control picture as regards agricultural pests in Louisiana, from research to application.

TIME brings changes

Yesterday's pesticides no longer get the job done. To keep pace with the times requires facilities, experience, productive capacity and sales coverage. Our long years in the chemical business have, we submit, afforded us all four. When you use Thompson-Hayward pesticides, you can be assured they are modern, honestly formulated, and that they will perform exactly as the label represents. What else can a pesticide be?

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North Central Weed Conference Held

WEED control experts from the United States and Canada spent a busy four days at a joint meeting of the North-Central Weed Control Conference and the Western Canadian Weed Control Conference, held in the Royal Alexandria Hotel, Winnipeg, Canada, December 8th to 11.

The outstanding feature of the conference was its international character, which facilitates the pooling by a large number of investigators of the latest information concerning the various aspects of chemical weed control. Dr. K. P. Buckholtz, University of Wisconsin, in opening the conference as president, stated that "in the short space of ten years, weed control has developed from curiosity into a vigorous young science, with its workers drawn from the fields of industry, education, regulation and research." He said that the reduction of weed losses in America's wheat crop by 10% will have the effect of increasing production by the equivalent of 6,000,000 acres in the U.S.A. and 2,500,000 acres in Western Canada. With only a few small areas still available for exploitation, chemical and cultural weed control is a very practical way of increasing food production in the face of a rapidly expanding world population, he added.

After the opening preliminaries, the conference settled down to hear more than 85 technical papers covering the most recent findings on the reaction of chemicals on weeds growing in field and horticultural crops.

H. E. Wood, of the Manitoba Weeds Commission, reporting on the results of a survey, revealed that wild oats infest nearly 100,000,000 acres of crop land in the northern portion of the Great Plains region of North America. This weed is a pest associated with small farming and is found in an area extending from Minnesota, through parts of North Dakota, South Dakota, Montana and the prairie provinces. A concerted effort is being made to find a chemical means of controlling it. Reports from numerous workers attest to the effectiveness of maleic hydrazide and "Endothal," although further testing is needed.

The conference gave special consideration to reports by Dr. P. J. Olson, University of Manitoba, and professor R. S. Dunham, University of Minnesota, on the effect of herbicides on oats and flax, since these crops are more susceptible to 2, 4-D than either wheat or barley. When it came to considering recommendations, "MCP" was approved for use on these crops and clovers, except sweet clover. TCA was recommended for the control of Green Foxtail flax, and for Couch Grass in patches.

Below (L to R): Dr. G. F. Warren, department of horticulture, Purdue University, Lafayette, Ind.; Dr. C. J. Willard, department of Agronomy, Ohio State University, Columbus, pas president of the NCWCC; Dr. K. P. Buchholtz, University of Wisconsin, Madison, president of the Conference; and H. E. Wood, Manitoba department of agriculture, who acted as chairman of the Canadian meeting.

"CMU" was recognized as one of the more promising soil sterilants for use in the control of perennial weeds growing on non-crop land. "DNBP" has given the most consistent results as a pre-emergence herbicide for soybeans.

While recognizing that good management and controlled grazing are most important in any attempt at weed control on pasture land, 2, 4-D and 2, 4, 5-T will do an effective job in checking weeds and woody growth.

Woody Growth Control

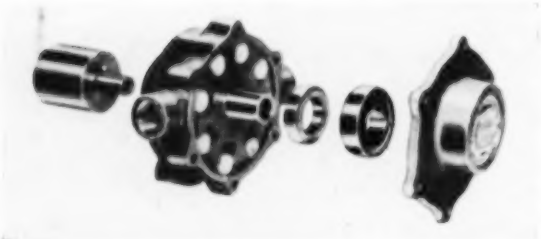
SEVERAL representatives from industry and government reported on the succesful use of herbicides in the control of woody growth along highways and rights-of-way. J. W. Suggitt, of the Ontario Hydro Commission, stated that "experimental and large scale commercial applications have shown that the elimination of unwanted brush by herbicidal spraying is practical and much more economical than hand clearing operations." Dormant spraying during the fall and winter has proved to be a valuable adjunct to foliage spraying. L. Playfair from the Manitoba Power Commission, reported successful results on 240 miles of power line right-of-way, using 2½ lbs. of mixture of 2, 4-D and 2, 4, 5-T in 12½ gallons of diesel fuel per acre,at a cost of $35.00 per mile.

The greatest potential in the use of herbicides is likely to be developed in the use on horticultural crops. One session was devoted to this subject and some of the most interesting reports of the conference were presented by horticulturists from the Universities of Wisconsin, Minnesota, Indiana, Manitoba, Missouri and Ohio. Dr. R. E. Nylund, Minnesota, reporting on tests of some thirty chemicals, stated that "Stoddard Solvent, 'KCNO' and 'CMU' appear to have the most value as pre-emergence herbicides for onions. Dr. L. G. Holm of Wisconsin said that "it is possible greatly to reduce the cost of weeding many horticultural crops by using the proper chemical. Chemical control, however, should only be used to supplement standard cultural practices."

The conference approved recommendations for use of chemicals on asparagus, beets, carrots, celery, onions, cabbage, vine crops and sweet corn.

The conference also devoted some time to consideration of problems arising out of the registration of chemicals—a subject of vital interest to the large number of industrial representatives in attendance. J. A. Noone, technical adviser of the National Agricultural Chemical Association, Washington, in discussing the problem of the registration of chemicals, stated that "cost of research, coupled with cumbersome procedures, are discouragaing research in the field of pest control chemicals." He pointed out that to obtain registration, manufacturers must submit adequate data to support label claims, entailing a program of research which may involve expenditures of over $1,000,000 to develop a single product. Referring to the

Hypro 750 and 6000 Pumps Designed for Heavy Duty Spraying



Hypro 750 Direct Drive Pump will deliver approximately 15 gallons per minute at 600 R.P.M. Ideal for spraying on livestock or around cattle barns and for cattle grub control.

"Roller Design" Field Proven For General Spraying Use

A proven direct-drive ball bearing tractor pump designed especially for cattle grub control, weed, insect, and pest spraying, and liquid fertilizer applications, is being offered by *Hypro Engineering, Inc., Minneapolis, Minnesota.*

Designated Model No. 750, the Hypro direct drive pump will fit power take-off shafts on tractors, trucks, jeeps and similar equipment. Instantly self-priming, the unit delivers approximately 15 gallons per-minute open discharge at 600 r.p.m. and has a pressure range from 0 to 350 lbs. per sq. inch.

Hypro 750 direct drive tractor pumps feature permanently lubricated sealed ball bearings, a stainless steel shaft, mechanical unit seals, and ¾" standard pipe thread ports. Nylon rollers with brass or stainless steel core are tough, resilient, abrasion and chemical resistant, and water lubricated.

"Ni-Resist" (a rust-wear resistant, high nickel content, ferrous casting) is used in the case and rotor. "Ni-Resist" is noted for its ability to withstand corrosion, heat, wear and high impact. Corrosive liquids such as liquid nitrogen have shown little effect on "Ni-Resist." The high nickel content imparts non-magnetic and stainless steel characteristics to the "Ni-Resist" case and rotor, thus offering excellent rust resistant qualities.

Sleeves and hub adapters are available in various sizes for power take-off use. A shear pin in the adapter hub protects the pump and PTO shaft. Pump weight is only 11 lbs.

For literature and price information, write *Dept. 204, Hypro Engineering, Inc., 404 No. Washington Ave., Minneapolis 1, Minnesota.*

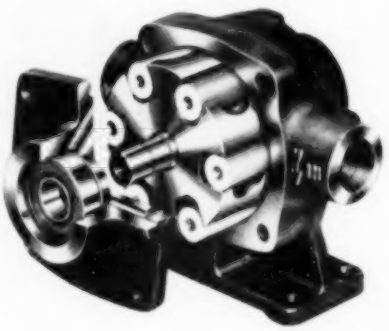
Hypro 6000 Handles Power Suspension Mixtures, Emulsions

A new popular-priced roller-type pump designed for belt and pulley or direct drive operations on tractors, electric motors or gas engines, is being offered by *Hypro Engineering, Inc., Minneapolis, Minnesota.*

Termed the 6000 series, this many-purpose farm sprayer pump is a "junior" model of the larger 750, and utilizes the same field-proven design features at lower capacities. Instantly self-priming, the unit delivers approximately 12.5 gallons per minute at 800 r.p.m. and has a pressure range from 0 to 200 lbs. per sq. inch.

Featuring sealed, permanently lubricated ball bearings, the model 6000 has stainless steel or brass unit seals with either leather or rubber membrane. A suction "Bleed-Back" port ahead of each seal assures long seal life. Nylon rollers with brass core are chemical and abrasion resistant. A scoop in the rotor slots allows liquid to flow in behind the rollers, thus increasing the capacity of the pump. The pressed fit of the shaft in the inner race of ball bearings restricts lateral rotor movement and avoids metal-to-metal wear of the rotor against the pump case. The shaft is 5/8" stainless steel.

Pump case and rotor are available in either cast iron or "Ni-Resist" material. "Ni-Resist," a rust and wear



Cut-away view of Hypro 6000 pump illustrates pressed fit of shaft in inner race of ball-bearings. Lateral rotor movement, causing metal-to-metal wear, is restricted.

resistant, high nickel content, ferrous casting, is noted for its ability to withstand corrosion, abrasion and high impact. The high nickel content gives the case and rotor non-magnetic and cast stainless steel qualities.

The 6000 series pump has ¾" pipe connections. It can be mounted directly on truck or tractor PTO shaft. It is furnished with base plate and solid shaft for gas engine and belt and pulley drive. For PTO use, sleeves and hub adapters are available in all shaft sizes. Pump weight is 10½ lbs.

For literature and price information, write *Dept. 204, Hypro Engineering, Inc., 404 No. Washington Ave., Minneapolis 1, Minnesota.*

registration of weed killers, he emphasized that it has been the unfortunate experience of many companies doing research in this field, that after they have spent a great amount of time and money obtaining data and believe they have the product ready for marketing, they encounter unexpected and unpredicted obstacles. The difficulty, Mr. Noone reported, stems from the fact that in the Federal and State Acts "there are no objective standards for determining the adequacy of a test program or evaluating the data obtained; rather, they are subjective standards based on the regulatory officials' interpretation of what the Act requires, or may require, and as such are subject to personal interpretation depending on any number of facts.

From a report given by P. M. Overholt, associate chief, Plant Products Division, Canada Department of Agriculture, Ottawa, it was apparent that Canada, with one federal law gov.rning product registration, has less rigid requirements.

As a means of strengthening industry - government co - operation, Dr. Buchholtz suggested that more industrial concerns might give favorable consideration to supplying government workers with data on methods of manufacture, solubilities, possible health hazards, plant responses and other facts about the product, useful for one who must talk about it intelligently. Such a procedure would help to avoid blind acceptance or rejection.

Delegates took time off for social activity, being reception guests of the Pittsburgh Agricultural Chemical Company on one occasion, and on another, the Canadian chemical companies acted as hosts. The official banquet was highlighted by the presentation of honorary membership in the N.C.W.C.C. to H. E. Wood, who has worked during the past ten years to promote more effective weed control. Chemical industries also made a presentation to Mr. Wood in recognition of his many contributions to the advancement of chemical weed control in Western Canada.

Each year two awards are made by the N.C.W.C.C. for outstanding work in weed control. This year the recipients were E. H. Buchingham, District Agriculturist at Vermilion, Alta., and A. T. Olien, County Weed and Seed Inspector, Yellow Medicine County, Minnesota.

Charles J. Gilbert, State Weed Board, Brookings, South Dakota, was elected president of the North Central Weed Control Conference for the coming year. He will be assisted by Dr. Oliver C. Lee, Botany Department, Purdue University, Lafayette, Indiana, as vice-president, and Dr. F. W. Slife, University of Illinois, Urbana, Ill., as secretary-treasurer. Next year, the four weed conferences, North - Central, South-Eastern, Western and West-Central, will meet jointly at a national weed meeting on December 8th to 11th in Kansas City, Missouri.

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Ferro Du Pont Market FTE

That its new fritted trace element product, "F.T.E." would be placed on the market in 1953, was announced by the Ferro Corporation, Cleveland, Ohio, at a press conference in New York, December 9. The product will be marketed to crop growers and the fertilizer trade by both Ferro and E. I. duPont de Nemours & Co., Inc., Wilmington, Del.

C. D. Clawson, Ferro Corp. president, in describing the product, stated that it contains small quantities of manganese, iron, zinc, copper, boron and molybdenum, trace elements frequently needed in addition to regular fertilizer mixtures. He declared that "FTE is the first practical form of trace elements to provide a slowly soluble source of minerals necessary for plant growth."

Advantages of FTE over conventional trace element applications were enumerated by Mr. Clawson as including: stability in the soil; will not combine with other elements to become unavailable to plants; will remain in the soil for the entire season; and prevents toxic amounts of trace elements from injuring plant roots because of its relative insolubility.

Five years of study preceded the placing of FTE on the market, Mr. Clawson reported. In addition to tests made by the company, additional experiments were conducted at Michigan State College, University of Georgia, and the New Jersey Agricultural Experiment Station, New Brunswick, N. J.

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Named Union Bag VP

S. K. BRADLEY

Union Bag and Paper Corp., New York, has announced the election of S. K. Bradley as vice-president in charge of multiwall bag sales. Mr. Bradley will continue to make his headquarters in New York. He has been with the firm since 1938 and was previously director of multiwall bag sales.

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Colo. Assn. Names Officers

The Colorado Agricultural Chemical Association elected as its 1953 president, Claine E. Titensor, Denver, at its recent meeting in that city. Mr. Titensor succeeds Carl Dewey, Grand Junction, Colo. as head of the trade group comprising all of the state's manufacturers and distributors of agricultural chemicals.

Other new officers named at the meeting are Sam McCampbell, Eaton, vice-president; W. D. Smith, Lakewood, secretary-treasurer; Dr. B. Thomas Snipes and Dr. W. E. McCauley, both of Denver, directors.

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Fertilizer Veteran Dies

Albert S. Johnston, 69, who spent 40 years in the fertilizer business in Atlanta, Ga., died there recently. He had retired in 1947.

Cal. Weed Meet. Jan. 20-22

The California Weed Conference will hold its fifth annual meeting at San Jose, Calif., January 20, 21 and 22, according to R. N. Raynor, Dow Chemical Co., San Francisco, Calif., secretary of the Conference. Headquarters for the event will be the Hotel St. Claire, with meetings being held in the San Jose Municipal Auditorium, Mr. Raynor says.

Panel discussions were on the program, with topics including new methods of weed control and brush control with various herbicides.

Officers of the California Weed Conference, in addition to secretary Raynor, are W. A. Harvey, extension weed control specialist, University of California, Davis, president; Marcus Cravens, deputy agricultural commissioner, Santa Barbara County, vice-president; and Norman A. Akeson, division of agricultural engineering, University of California, Davis, treasurer.

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Offers "CDAA" Regulator

A new plant-growth regulator, known as "CDAA," (α-cyano-β-(α,4-dichlorophenyl) acrylic acid) has been announced by workers at the Battelle Memorial Institute, Columbus, Ohio, who, in cooperation with researchers from Ethyl Corporation, discovered the properties of this compound.

CDAA has been studied in greenhouse experiments on tomato and marigold plants, according to R. E. Hay and D. P. Uhl, of Battelle, and W. B. Ligit and Calvin N. Wolf, Ethyl Research Laboratories, Detroit. They report that when applied at low concentrations, the compound produced the effects of inhibiting growth of the main stem of tomato plants and the flowering of marigold. These results were achieved without visible injury to the plants and without an over-all slowdown of growth, the report said.

Potential uses for CDAA and other derivatives are not confined to tomato plants and marigold, it was pointed out.

More Phosphate Fertilizer

A joint announcement has been made in Wendell, Idaho, by Gates Bros., Inc., manufacturers of phosphate fertilizers, and in Los Angeles, California, by the Ralph M. Parsons Company, engineers and constructors, of an agreement under which the two companies will combine their experience to build phosphate fertilizer plants throughout the world.

Charles T. Gates, president of Gates Bros., stated that his company has developed and are operating a modern high analysis fertilizer plant in which full use has been made of continuous processing techniques, requiring about three hours time from raw rock to finshed product. The company has been supplying phosphate fertilizers to the western market for a number of years.

Ralph M. Parsons, president of the Ralph M. Parsons Company, announced that his company will engineer and construct wet process phosphoric acid plants and triple superphosphate plants based on Gates' design. The Ralph M. Parsons Company maintains a number of branch offices in the United States and abroad and is engaged in the design and construction of facilities for the process industries on a world-wide scale.

At the annual stockholders meeting of Gates Bros., Inc., a $2,000,000 stock and bond issue was approved to expand triple superphosphate production. It is understood details of the expansion will be announced in January when final contracts have been signed. Gates Bros. will be associated with other interests well established in the chemical industry.

TECHNICAL BRIEFS

(*Continued from Page 83*)

number of mites dropped again. Field experiments will be tried next season to see whether the laboratory results are duplicated under outdoor growing conditions. Dr. Garman's long term objective is to determine whether mite populations can be controlled by juggling the fertilizer formula. Pending such a possibility, however, he indicates that more conventional methods of insecticide use are showing rapid progress. Systemics have shown remarkable success, he reports, on greenhouse roses. Though systemics obviously have no place on food plants, he indicates that they have at least partially solved the mite problem on ornamental plants.

HEPTACHLOR

(*Continued from Page 75*)

might be present residually at harvest time on plants treated with heptachlor, or grown in heptachlor-treated soil.

The basic problem was to develop a test so definitive that it would measure accurately quantities of a specific insecticidal material or the order of as little as one-tenth of one part per million. The actual analytical procedure that was devised and perfected measures heptachlor residues in a quantity as low as one-hundredth of one part per million. This method is described in "Detection and Determination of 1,4,5,6,7,-8,8-heptachloro - 3a,4,7,7a-tetrahydro-4,7-methanoindene" by Dr. Percy B. Polen and Mr. Paul Silverman published in *Analytical Chemistry*, Vol. 24, Pages 732-735 (April, 1952).

A system of extraction procedures was devised to prepare crop samples for analysis. In several cases modifications of the basic analytical procedure were necessary to eliminate interference caused by natural substances. A bio-assay test was developed to serve as a check for the chemical test.

Carefully controlled field test programs were organized in various sections of the country. Heptachlor formulations were applied to vegetable crops, fruit, forage and cotton. Accurate records were, of course, kept by the field workers of the rate of application of each formulation used, and the climatic conditions during the entire growing period. At maturity the treated crops were carefully harvested, packaged and rushed to the Velsicol laboratories. There the harvested crops, as well as check samples and soil samples, were processed immediately and analyzed. Duplicates of the processed samples were submitted for bio-assay.

One of the tests included in the project concerned applications to cotton. This particular part of the program investigated the question of possible translocation. Cotton plots in several different areas were treated with the recommended acreage dosages of heptachlor. In each case, an untreated plot was reserved as a check. After the cotton was picked and ginned, the cotton seed was crushed in the usual manner for cotton seed oil and cotton seed meal. The cotton seed oil and the cotton seed meal produced from each of the plots was processed and analyzed for heptachlor content by the chemical test. In addition, portions of the processed materials in each case, were submitted for bio-assay tests.

The data obtained in the course of these tests clearly refute any supposition of heptachlor translocation in cotton at the recommended levels.

A second type of test measured heptachlor residues on or in crops grown in soil which had been treated for the control of wireworms, onion maggots, and other soil-infesting insects. Field tests were set up as in the previous instance and at harvest time the crops grown in the treated soil, and similar crops grown in the adjacent check plots were shipped to Velsicol laboratories for analysis. Residue results obtained in this second series of tests emphasize the value of heptachlor in treating agricultural crops.

This project served to clarify many of the questions concerning possible residue of heptachlor. Definite data were obtained which established the low order of residue levels occurring after heptachlor crop treatment. These results can be confirmed in other laboratories because specific test methods have been developed and standardized.

It is possible in the case of heptachlor to determine and to state

without equivocation the residue levels present in or on harvested crops which were treated with heptachlor during the growing season, or which were grown in heptachlor-treated soil.

Label Approval

THE research work which had originally resulted in the synthesis of heptachlor in the Velsicol laboratory followed by the various testing phases culminated in a last important step before commercial sale. Labels were prepared covering the applications in which heptachlor had been found to be particularly effective. These were submitted to the Production and Marketing Administration, U.S. Department of Agriculture. All the work that had been done so far would have been of little worth without approval by this agency of heptachlor for use in agriculture.

First approvals to be received were for heptachlor application against several cotton-infesting insects. To date, heptachlor applications have been given approval by the Production and Marketing Administration. For use in controlling insect pests as shown in table 2, page 74.

Field tests have been conducted on the following insects and crops and appropriate label approval will be sought after all results have been received and collated:

Insect	Crop
Cabbage Maggot	Cabbages
Cowpea Curculio	Field Peas
Mosquitos	
Onion Thrips	Onions
Onion Maggots	Onions
Root Maggots	Turnips
Rootworm	Peanuts
Thrips	Gladiolus
Ant	
Black vine weevil	Taxus, Yew
European Corn Borer	Corn
Cricket	Flax
Japanese Beetle Larvae	Turf
Sugar Beet Root Maggot	Sugar Beets
White Grub	Turf
Eye Gnat	Soil
Plum Curculio	Peaches
Seed Corn Maggot	Corn
Serpentine Leaf Miner	Tomatoes
Cherry Fruit Fly	Cherries

Additional information of applications and uses will be released as soon as approvals are obtained.★★

Safety Conf. for Atlanta

A symposium on fertilizer safety is on the program for the 14th annual Southern Safety Conference and Exposition to be held March 1-3 at the Biltmore Hotel, Atlanta, Ga. A good attendance from the southern states is expected.

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Ill. Group Elects Hartley

Harold J. Hartley has been employed as full-time secretary of the Illinois State Horticultural Society, the group has announced. Mr. Hartley will make his headquarters at 302 W. Walnut St., Carbondale, Ill. Mr. Hartley succeeds Harvey Hartline, who had served the society for a number of years as an elected officer.

COTTON PESTS

(*Continued from Page 33*)

he continued, "many instances of misuse of insecticides. These must be reduced to a minimum." But, he added," despite the cry of a few individuals that public health is seriously endangered, there is no evidence that pesticide residues are poisoning the people."

Elaborating on the theme of some misuse of pesticides in the field, he observed that legislation controlling custom applicators of pesticides is being considered by many states, and twenty states have passed laws (closely approaching the suggested model law). General adoption of regulations of this type is needed, Dr. Bishopp feels. But his general view on the subject of possible need for overall new laws is that "education, not legislation, is the most urgent need today."

Speaking on "Public Health Aspects of Pesticides," W. J. Hayes, Jr., Chief, Toxicology Section, U.S. Public Health Service, Savannah, gave results of a survey made in the Delta area of Mississippi in an attempt to determine whether use of insecticides in the state has led to any increase in disease. He reported that "no evidence could be found in the Delta that pesticides were the direct or indirect cause of any chronic disease, nor a contributory cause in diseases generally recognized as having other etiologies."

Disease ratio comparisons were made between the Delta area and the rest of the state for periods before newer type insecticides were widely used, and for the '52 season when the new chlorinated hydrocarbon and organic phosphate compounds were in widespread use. No more disease was noted in the Delta this year than in the earlier period, except for an increase in heart disease, which Mr. Hayes noted is on the general increase for other recognized causes throughout the entire country. There is more disease in the Delta area than in the rest of the state, he conceded, but this is generally considered to be the result of the lower standard of living and the inferior sanitary conditions in the area, and incidence of disease in the Delta has not increased relative to the balance of the state since the newer type insecticides were introduced.

Mr. Hayes also referred to more extensive studies made in Wenatchee, Wis., which also substantiated the view that "insecticides are not the cause of generalized disease, nor a contributory cause of diseases recognized as having other etiologies." His general conclusion after assaying the figures from both studies was that while careless use of insecticides can lead to a variety of illnesses for those who are directly and substantially exposed, no general increase has been noted in the incidence of disease as a result of insecticide use for those who are not directly exposed.

Continuing the discussion of hazards in connection with pesticide use at a panel discussion at the second session, the afternoon of opening day, Dr. G. C. Decker, head of the Section of Economic Entomology, Illinois State Natural History Survey, Urbana, observed that "in the past five years there seem to be no records of deaths, and few, if any, authentic records of illness attributable to pesticidal residues on foods." All surveys to date, he stressed, indicate that, by and large, the food supply is remarkably free of contamination by pesticides. "As a matter of fact," he told the group, "there is little or no sound factual information, nothing but suspicion, fear and apprehension to indicate that this country is confronted with an existing or imminent pesticide residue hazard. Somehow that fact must be made clear to the American public."

Dr. Decker emphasized, however, that those who develop new insecticides, and those who apply them as well, have a prime responsibility to see that the right materials are used in pest control,—and used safely. The supplier of insecticide raw materials, he reminded, has the responsibility for seeing that all facts about a new material, unfavorable as well as favorable, are brought to the attention of the user,—and the insecticide applicator, he reminded, must remember that the rights of his neighbors must be treated as more important than his own. Finally, Dr. Decker asserted, if it should be decided in the final analysis that new control measures are needed, it is to be hoped that they will be in the American tradition of fairness, and that we will never permit adoption of any unbalanced program where one agency may turn out to be prosecuting attorney, judge and jury.

Defoliation was described as a promising aid to insect control in a paper by E. W. Dunnam, entomologist, B. E. P. Q., Stoneville, Miss. Defoliation of cotton stalks aids materially in control of such pests as the boll weevil, bollworm, tobacco budworm, pink bollworm, cotton leafworm and cotton aphid, he reported.

Concluding this session, M.D. Farrar, head of the Department of Entomology, Clemson Agricultural College, Clemson, S. C., reported on "Research Highlights for 1952" His paper appears in full in this issue (See pg. 67). J. C. Gaines head, Department of Entomology, Texas A. & M. College, College Sta., Texas, supplemented this report by a discussion of "Promising New Developments in Insecticides." He gave particular attention to endrin, which apparently offers considerable pro-

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mise, and to the systemics, particularly Systox. He stressed also the importance of keeping in mind the availability of many alternate materials which are not as highly toxic as some of the more widely used insecticides. This list includes methoxychlor, DDD, Dilan, EPN, etc. While these materials in general are deficient in control to DDT, BHC, etc., there are many spots where the control they offer is adequate, and where the promise of lessened hazard can indicate their use.

Pink Bollworm Control

THE morning session of December 11th was devoted entirely to a discussion of the increased problem offered this year by the pink bollworm. Warning that continuing spread of the pink bollworm poses a serious threat to U. S. cotton production, Avery S. Hoyt, Chief, Bureau of Entomology & Plant Quarantine, Washington, made an urgent plea for expanded and more intensive research. He reminded that while total all-time cost of pink bollworm control has been only about 28 million dollars, in 1952, in the first season of important pink bollworm damage, losses in a few Texas counties alone were in excess of this figure.

K. P. Ewing, B. E. P. Q., Waco, Texas, in reviewing details of a greatly expanded research program on pink bollworm and its effective control indicated that research to find a more effective insecticidal control for the pink bollworm is being pushed as rapidly as possible. In particular, the possibility is being explored of developing a systemic pesticide which will be taken up by the plant and kill pink bollworms feeding on the plant.

"Our biggest problem with regard to chemical control of the pink bollworm," said A. N. White, of the Texas Agricultural Extension Service, Weslaco, Tex., "seems to lie in educating cotton growers in how to make infestation counts and to keep a close check as to whether the population is building up in their fields. . . . Many growers who failed to check their fields or who had light bloom infestation in 1952 and ignored it, ended up with very heavy damage."

Systemics Reported

THE closing session, the afternoon of the 11th, featured a panel discussion covering observations and experiences with insecticides, spraying and dusting equipment used this season. W. A. Ruffin, Alabama extension entomologist, warned that because boll weevil damage was comparatively light in 1951 and 1952, as a result of hot, dry weather, there is danger that farmers may relax their cotton insect control program during the 1953 season, which could lead to severe losses during the coming season. Most farmers are going to continue in a relaxed condition until they have been hurt badly, he predicted, unless the insecticide industry does an unusually good job of selling information, equipment and insecticides in 1953.

Reporting on "Systemic Insecticides," E. E. Ivy, B. E. P. Q., College Station, Texas, indicated that this type control is still in the future at least as far as control of the boll weevil and pink bollworm are concerned. Workers at the Basic Research Laboratory for Cotton Insect Control, College Station, have screened hundreds of compounds for systemic activity and most have the same limitation—they do not kill boll weevils or pink bollworms, he declared.

Many of the systemic insecticides which have been tested for boll weevil cannot be taken up by the cotton plant through its leaves. Most of the chemicals which killed boll weevils injured the cotton plant or tended to inhibit germination when used as seed treatments at dosages high enough to kill weevils.

"We do have one compound, Mr. Ivy indicated," that appears promising for boll weevil by seed treatment. This is a confidential compound synthesized by Gerhard Schrader and designated only as L-11-6. "The particular virtue of L-11-6 is the complete lack of phytotoxicity or inhibition of germination obtained when seed is treated with as much as 4 pounds of the chemical per 100 pounds of cottonseed."

Final speaker on the program was L. S. Hitchner, executive secretary of the National Agricultural Chemicals Association. Mr. Hitchner noted with concern that the "early buying program" which it was hoped had taken hold in '51 and '52 is now practically dead. Those who anticipated their needs last year found that there was an oversupply later in the season because of lessened demand, and will in all probability be loath to do any forward buying in advance of the '53 season. He emphasized however, that serious attention must be given the problem of distribution by those who make recommendations and influence the farmer as to his control program.

"We must use every means possible," he continued, "to have the farmer, the distributor, the dealer carry a portion of his requirements in the field or near the field for use when insects appear." He stated that more consideration should be given to preventive pest control and early application which make a more orderly distribution possible.

Mr. Hitchner illustrated his address with a chart showing the percentage of reduction in yield of cotton over a period of years caused by boll weevil, and related this information to the use of calcium arsenate during this period. He pointed out that after a heavy infestation of boll weevils, demand for pesticides increases, but then gradually drops until there is another outbreak.

Thus, historically, the standard pattern seems to have been that insecticide deliveries have always been out of phase with actual insecticide need. Big sales have normally followed heavy insect years rather than accompanied them, and then in years of heavy infestation, when ample insecticide supplies have been badly needed, the insecticide industry has not always been geared to make the necessary shipments as promptly as required.

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Defoliation Program Listed

January 16 was the date set for the seventh annual Beltwide Cotton Defoliation Conference at Memphis, Tennessee. Sponsored by the National Cotton Council, the meeting was under the general chairmanship of Dr. W. H. Tharp, U.S.D.A., Bureau of Plant Industry, Beltsville, Md.

A bulletin released early in January said that the relationship of defoliation to cultural practices and to cotton insect control would be analyzed at the meeting. Other problems to be studied were the use of defoliants, costs and benefits thereof, educational needs, techniques and practices, and the outlook for materials.

To appear on the program, according to the advance publicity, were the following: George J. Harrison, Shafter, Calif.; K. P. Ewing, Waco, Texas; John Green, Oklahoma Agricultural Experiment Station, Stillwater; E. B. Williamson, agricultural engineer, Delta Branch Experiment Station, Stoneville, Miss.; Grady B. Crows, Stoneville, Miss.; Tom Corley, Alabama Experiment Station, Auburn; Frank Fitzgerald, Raleigh, N. C.; and George Childress, Civil Aeronautics Administration, Washington, D. C.

A panel discussing "Benefits of Defoliation to Harvesting and Costs" was to be headed by J. Ritchie Smith, National Cotton Council, Memphis, with the other members of the panel including Marvin Hoover, California Agricultural Extension Service; and Don L. Jones, Texas Experiment Station, Lubbock.

Another panel, with Mr. Childress as moderator, was to discuss "Points to be Considered in Using Defoliants." Appearing on this panel were Stanley Strew, Palo Alto, Calif.; Tildon Easly, Starkville, Miss.; H. G. Ingerson, John Bean Div., Food Machinery Corp., Lansing, Mich.; J. Lloyd Poland, Niagara Chemical Co., Middleport, N. Y.; Paul Lloyd, Blytheville, Ark.; and Joe Noone, National Argicultural Chemicals Association, Washington, D. C.

Still another panel covering "Industry's Role in Defoliation" was to be headed by M. V. Bailey, American Cyanamid Co., New York. Panel members were to be L. E. Cowart, E. I. du Pont de Nemours & Co., Inc. Eagle Pass, Texas; John Massengale, Sharples Chemical Co., Wyandotte, Mich.; Frank Stark, American Cyanamid Co., Stamford, Conn.; and I. W. Bales, Chipman Chemical Co., Boundbrook, N. J.

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Soil Improvement Meeting

A joint meeting of the Midwest Soil Improvment Committee, with industry, is to be held at the Palmer House, Chicago, February 20, it has been announced. Agronomists and soil scientists from Federal and State agencies, Land Grant Colleges and the industry from 13 midwestern states are expected to attend the event which last year attracted 325 persons.

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Names New Personnel

Appointments to posts at Cyanamid Company's nitrogen products plant now under construction near New Orleans, Louisiana, have been announced.

W. J. Swigert was named production assistant, L. Seiden will be in the statistical control group, and Jack W. Young will be purchasing agent and traffic manager.

Other appointments announced recently by G. J. Forney, plant manager, include: R. L. Hock as assistant manager; V. E. MacDonel as chief engineer; M. A. Stimola is industrial relation director, and Dr. Donald L. Fuller as technical director.

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Texas Fertilizer Conference

The Texas Fertilizer Conference was being held January 8 and 9 at the Memorial Student Center, College Station, Texas. According to the advance program distributed by Dr. J. F. Fudge, Department of Agronomy, Texas A. & M., the following were scheduled to appear at the two-day session.

Director G. G. Gibson was to preside at the first morning's session, with an address of welcome and a response by C. D. Shallenberger. John G. McNeely, was to speak on the "Agricultural Outlook for 1953" and a talk by J. R. Johnston on water system research was to conclude the morning's session.

R. D. Lewis, director, was to preside at the afternoon session giving a paper on the Texas fertilizer research program. Further reports on fertilizer research were to be presented by P. R. Johnson, J. C. Smith, J. W. Collier and H. W. Gausman. Fertilizer recommendations for 1953 were to be presented by M K. Thornton.

A banquet that evening was to feature a talk by Dr. J. E. Adams on "The National Program for Fertilizer and Lime Utilization."

Dean C. N. Shepardson was to preside at the morning session of January 9, featuring a panel discussion of a course proposed for introduction into the curriculum of the department of agronomy. This panel was to be led by Jaime Morris assisted by H. C. Aaron, W. Q. Burns, James D. Dawson, Jr., N. D. Morgan, M. D. Seay and R. P. Thomas.

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Western Weed Group Meets

The research section of the Western Weed Conference plans to hold a meeting at Boise, Idaho, in March, according to Dr. F. L. Timmons, Utah Agricultural Experiment Station, Logan.

NE Weed Meet Under Way

The seventh annual Northeastern Weed Control Conference was under way at the Hotel New Yorker, New York City, as this issue went to press. Beginning January 7 and continuing through the 9th, the meeting program included scores of technical papers on the chemical control of unwanted vegetation, discussions on application equipment and the public health aspects of weed control.

Dr. C. E. Minarik, Camp Detrick, Md., president of the Conference, was to be chairman of the opening session Wednesday; and R. H. Beatty, American Chemical Paint Co., Ambler, Pa., the afternoon session. Subjects for discussion at the first day's meeting included control of aquatic weeds, methodology in evaluating herbicides and measurement of volatility of weed killers.

Concurrent sessions were on the program for each of the remaining two days, with chairmen of the various sessions including S. B. LeCompte, Rutgers University, New Brunswick, N. J.; T. W. Odland, University of Rhode Island; W. C. Bramble, Pennsylvania State College; E. M. Rahn, U. of Delaware; R. E. Engle, Rutgers; S. W. Gilcreas, New York City Dept. of Health; and Stanford N. Fertig, Cornell U., Ithaca, N. Y.

Officers of the N.E.W.C.C., in addition to president Minarik, are R. H. Beatty, vice-president and W. C. Jacob, Cornell University, secretary-treasurer. The program included an election of officers. A complete report of the 1953 meeting will appear in the February issue of Agricultural Chemicals.

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Coast Guard Fights Weeds

The U. S. Coast Guard is embarking upon a vegetation control project with the hope of utilizing chemicals wherever practicable according to Capt. C. E. Brush, Chief, testing and development Div. The problem as it now exists involves two separate kinds of situations, he says. In one there is the problem of controlling plants that tend to obscure aids to navigation. The areas concerned are those located on river banks and harbor approaches. The offending plants are primarily those that grow on land over high water tables or on tidal flats. The inland waterways of the Mississippi, Ohio, Missouri, and Tennessee Rivers are of immediate concern.

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APS Branch Meets in Feb.

The annual meeting of the Potomac Branch of the American Phytopathological Society will be held at the Bureau of Plant Industry station auditorium, Beltsville, Md., February 19 & 20, it has been announced. Featured on the program is Dr. J. G. Harar, Rockefeller Foundation, New York City, who will report on cooperative work in Mexico toward control of important diseases of wheat and other grains, based on his five-year experience in that country.

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Offers New Herbicide

Eston Chemicals Division of American Potash & Chemical Corpoation, Los Angeles, has announced the availability of a new non-selective herbicide being marketed under the trade name of "Tumble-Weed 25." The herbicide contains 25 per cent sodium chlorate and a minimum of 75 per cent soluble borates plus a wetting and spreading agent. Properly applied, it will kill weeds and grasses and leave the soil sterile for a year or longer, the makers state. As a general killer it can be applied to both broad-leaf and narrow-leaf weeds and grasses.

The product is to be marketed on a national basis through the Eston and American Potash & Chemical sales organizations. Robert Finch, of American Potash & Chemical Corporation, Los Angeles, is spearheading the sales development work.

The company points out that its new product kills weeds in noncultivated areas where they constitute a nuisance or fire hazard.

Among the weed pests it is designed to control are Bermuda Grass, Bind Weed, Hoary Cress (Whitetop). Quack Grass, Johnson Grass, Canada Thistle, Leafy Spurge and a host of other deep or shallow-rooted varieties.

"Tumble-Weed 25" is packaged in 50-pound polyethylene-laminated valve bags.

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Canadian Plant Now Open

Ontario Plant Foods, Ltd., has recently opened a new fertilizer plant near Delhi, Ontario, according to George Roe, general manager. The firm, supplying fertilizer materials for Ontario tobacco growers in southern Canada, is now in full production for the 1953 season and was to make deliveries in January.

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NW Veg. Insect Conference

Two important meetings at which agricultural chemicals are discussed will be held at the Imperial Hotel, Portland, Oregon late in January. The first, the Pacific Northwest Vegetable Insect Conference, will begin January 19 and continue through the 21st. The second group is the Western Cooperative Spray Project, which begins its sessions on the 21st and terminates the 23rd., according to Dr. H. S. Telford, Washington State Collegt entomologist, Pullman, Washington.

The Vegetable Insect Conference is expected to attract both state and federal entomologists as well as interested persons form western Canada. Part of the sessions will be open for industry representatives during the week, it was noted.

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Fertilizer Section Gains Natl. Safety Group Status

Full sectional status has been granted the Fertilizer Section of the National Safety Council, it has been announced. The acceptance came by unanimous vote at a meeting in New York, December 15, attended by the Fertilizer Safety Committee and representatives of the National Safety Council.

Up to this point, activities of the fertilizer safety group had been co-ordinated with those of the N. S. C., but on an unofficial basis, it is explained. John E. Smith, Spencer Chemical Co., Kansas City, Mo., is chairman of the Fertilizer Section.

Gage Heads Grace Chemical

William P. Gage will become president and director of Grace Chemical Co., a subsidiary of W. R. Grace & Co., on February 1, it has been announced. Mr. Gage has been vice-president in charge of manufacturing of Shell Chemical Corporation, since 1941. Grace Chemical Co. organized in 1952 and is currently constructing a $20 million nitrogen plant near Memphis, Tenn.

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S. C. Fertilizer Meet Held

Fertilizer salesmen, dealers and manufacturers of South Carolina were expected to be on hand for the one-day state-wide fertilizer conference scheduled to be held January 15. The place was the Wade-Hampton Hotel, Columbia, S. C. According to Bruce D Cloaninger, Clemson Agricultural College, Clemson, S. C. in charge of the event, a large and representative crowd was anticipated.

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Building Fertilizer Plant

A $3.5 million fertilizer plant is scheduled by the Missouri Farmers Association for construction at Joplin Mo., according to Loryn E. McQuerter, manager of the M.F.A. plant foods division. Construction is expected to start this summer, with initial operation scheduled for the summer of 1954.

The Association has retained the Dorr Company, Stamford, Conn., as consultants and architect-engineers on the design and construction of the plant, it has been announced. The Dorr-Strong phosphoric acid and ammonium phosphate processes will be used in the manufacturing program.

Other materials scheduled to be employed by the new plant include Florida phosphate rock; by-product sulfuric acid from Eagle-Picher Co., Galena, Kansas; anhydrous ammonia and muriate of potash.

The plant will make finished products such as concentrated phosphoric acid, triple superphosphate and a wide range of high analysis granular fertilizers averaging between 40 and 55% plant food. Some of the grades set for manufacture include 15-15-15; 14-28-14; and 11-33-11.

Capacity is to be 75 tons per day of P_2O_5 in the form of phosphoric acid which in turn will be used in the manufacture of high-analysis fertilizer and triple superphosphate.

The Association has more than 143,000 members and is credited with pioneering the sale of high analysis products in the state by introducing these grades to the trade in 1948. It is reported that the M.F.A. that year, sold in Missouri, 92% of all fertilizer testing 40 units or higher.

Cotton States AAEE to New Orleans

PROGRAM plans for the 26th annual meeting of the Cotton States Branch, American Association of Economic Entomologists, have been announced. The meeting is scheduled to be held at the Jung Hotel, New Orleans, La., February 9-11, jointly with the Louisiana Entomological Association.

Appearing on the first day's program will be Dr. Kirby L. Cockerham, Louisiana Extension Service, Baton Rouge, chairman of the Cotton States Branch; and Dr. Charles E. Palm, head, Department of Entomology, Cornell University, Ithaca, N. Y., president of the newly-organized Entomological Society of America. Dr. Cockerham announced his subject as "A Plea for a Return to Fundamental Research in Entomology." A. L. Hamner will preside at the remainder of the first morning's session.

Papers scheduled for presentation at the afternoon session with C. H. Alden presiding, include "Effects of Pyrethrum and Lindane on the Protection of Corn and Rough Rice from Stored Grain Insects," by E. H. Floyd and C. E. Smith, Louisiana Agricultural Experiment Station, Baton Rouge; and "Insect Pests of Stored Corn in North Carolina," by Walter M. Kulash, North Carolina State College, Raleigh. Clay Lyle, Mississippi State College, will preside at the second half of the afternoon session.

Among papers to be presented at Tuesday morning's meeting, with C. E. Smith in charge, will be some giving reports on pest control experiments in various fields. "Practical and Economical Methods of Control for the White-Fringed Beetle Available for the Farmer or Grower," is the title of a paper by C. C. Francher and F. J. Bartlett, U.S.D.A., Florala, Alabama; while another paper will report on "The Effectiveness of Surface Insecticide Treatments Against the White-Fringed Beetle on Non-Cultivated Land." The latter was prepared by Hiram C. Young and H. S. Hollingsworth, U. S. D. A., Florala Ala.

Ralph Mathes, L.J. Carpentier and W. E. Haley, U.S.D.A., Houma, La., are co-authors of another paper scheduled for delivery at this session. It is entitled "Insecticidal Control of Soil Insects in Louisiana Sugarcane Fields in 1952." A discussion of systemics will be heard in a paper by B. W. Arthur, Alabama Agricultural Experiment Station, Auburn, "Effect of Certain Systemic Insecticides on Peanut Insects and Peanuts."

R. C. Gaines will preside at the final portion of the morning session which will include a report on how insect surveys are conducted, by Kelvin Dorward, U.S.D.A., Washington, D. C.; a paper on "Insecticides in Granular Form," by M. D. Farrar, South Carolina Agricultural Experiment Station, Clemson, S. C.; and "Toxicity of Certain Organic Insecticides to Several Species of Animals" by F. S. Arant, Alabama Agricultural Experiment Station, Auburn. James A. Griffin, also of Auburn, will discuss "Control of Wireworms Attacking Sweet Potatoes" in a paper of that title.

In the afternoon, attention will be focused on insect control in cotton. With E. W. Dunnam presiding, the following papers are among those scheduled for presentation: "The effect of Chemical Control on Insect Infestation and on Yield and Quality of Cotton," by G. H. Blake, Jr., Auburn, Alabama; "Insecticide Tests for Control of the Boll Weevil, Bollworm, Cotton Aphid and Two-Spotted Spider Mite on

Cotton in 1952," by M. T. Young and R. C. Gaines, U.S.D.A., Tallulah, La.; and "Tests with Some of the Newer Organic Insecticides Against the Boll Weevil, Cotton Aphid and Spider Mites on Cotton," by L. C. Fife, U.S.D.A., Florence, S. C. Bruce Mitchell, Baton Rouge, La., will discuss "Bollworm Control in the Red River Valley."

The discussion is scheduled to take a slightly different twist in the final session of Tuesday afternoon, with the subject of fertilizers being brought up. "Rice Weevil Damage in Corn as Affected by Fertilizers" is the title of a paper by W. G. Eden, Auburn, Alabama; while another paper, "The Effect of Nitrogen in Fertilizers on Earworm Damage to Corn" will be presented by W. A. Douglas, and Robert C. Eckhardt, both of U.S.D.A., State College Mississippi.

Dr. Cockerham will be chairman of the final meeting on Wednesday morning which will feature a discussion of control of pests on sweet corn. A. N. Tissot, Florida Agricultural Experiment Station, Gainesville, will be the leader.

The meeting ends in a business session which will adjourn to attend the general session of the Association of Southern Agricultural Workers, meeting at the same time as the Cotton States Branch.

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S. W. Branch Program

Further meeting plans for the Southwestern Branch, A. A. E. E. meeting, to be held at the Galvez Hotel, Galveston, Texas, February 26 & 27, have been announced by P. J. Reno, Hercules Powder Co., Dallas, Tex., chairman of the branch. He advises that more than 300 persons are expected to attend the conference.

A. J. Garon, chairman of the local arrangements committee, states that plans are completed for an informal shore dinner to start off the meeting program on the evening of February 25.

According to Dr. R. L. Hanna, chairman of the program committee, speakers at the two-day sessions will include Dr. Charles E. Palm, president of the new Entomological Society of America; Dr. E. Gorton Linsley, retiring president, E.S.A.; Dr. H. G. Johnston; and Dr. E. W. Laake, who since his retirement from the Bureau of Entomology and Plant Quarantine, has been with the Office of Foreign Agricultural Relations in South and Central America.

DDT Price Drops

The price of DDT suffered another drop early in January when a major producer lowered his quotation to 23¢ per pound, technical, from 25¢. Susequently, it was reported in the trade that this supplier had withdrawn from the market and was not shipping further supplies at this price, leaving the market in a rather confused condition.

There were elements of strength in the market as well; of particular importance being the reported opening of government bids to supply the General Service Administration with 8 million pounds of technical DDT in the form of various formulations. Filling government demands of this size, might well dry up some of the excess stocks that have been hanging over the market, according to some trade observers.

The drop in DDT prices followed an announcement in mid-December of price-reduction in other insecticidal raw materials. The producer of Toxaphene is reported to have dropped his price from 24¢ to 17¢ per pound, while the prices of aldrin and dieldrin were also cut by their producer.

New Davison Plant for Ind.

Plans for construction of a $1,000,000 fertilizer plant on a twenty acre tract near New Albany, Indiana, have been announced by W. N. Watmough, Jr., vice president of The Davison Chemical Corporation, Baltimore, Md.

The plant will be of latest design, incorporating facilities for production of Davison homogeneous granulated mixed fertilizer, and increased capacity to meet the demand for the company's products. The erection of the new plant is required because the newly constructed Ohio River Levee does not protect the present plant, located on the north bend of the river, Mr. Watmough says.

It will be designed and constructed by the John J. Harte Company, Engineers and Constructors, of Atlanta, Ga., and is scheduled for completion in the Fall of 1953.

Management will continue under J. L. Gayle as plant manager and George Klein, district manager.

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NAC Meeting Planned

Although meeting plans have not yet been completed, the National Agricultural Chemicals Association is moving ahead with an "outstanding" program for its annual spring convention scheduled to be held at the Jung Hotel, New Orleans, La., March 11-13.

Lea S. Hitchner, executive secretary of the Association, Washington, D. C., has indicated that an unusually large crowd is expected.

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Offer Grass Retardant

Loamium Co., New York, announced at a press conference in New York City early in January that they will have a chemical grass retardant on the market this spring. Based on maleic hydrazide, it will be offered as a water-soluble powder under the name, "Kem-Kut". It was developed by the Naugatuck Chemical Division of U. S. Rubber Co. at their experimental farm at Bethany, Conn. It was expected that first stocks would be offered in seed stores and other retail outlets around the New York area in late February.

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Ashcraft Ups Personnel

Ashcraft-Wilkinson Company, Atlanta, has announced changes in the firm's top management, effective January 1.

Lee Ashcraft, one of the company's founders, has been made chairman of the executive committee; George W. McCarty, president since 1944, becomes chairman of the board. The new president is Van W. Wilkinson, formerly vice-president, who has been with the company since its founding in 1912.

Other promotions announced were: John E. Foy, Jr., Tampa, Fla., to vice-president; Walter J. Fargason, Atlanta, to secretary-treasurer; and W. Mercer Rowe, Jr., to assistant vice-president. Mr. Rowe will be in charge of the Pesticide division.

Industry Patents

2,619,767. Crop-Dusting Unit. Patent issued Dec. 2, 1952, to Eric M. Woock, Lodi, Calif. A crop dusting unit comprising an upstanding frame, a dust hopper mounted on the frame, a vertical axis blower mounted on the frame below the hopper in position to receive dust therefrom, means to drive the blower, said blower including a housing, the top of the housing having a circumferential row of intake openings therethrough about the blower axis and defined by a spider included in said top, a circular dust distributor plate seated on the central portion of the spider and disposed normally coaxially with respect to the blower axis and lapping the intake openings to a partial extent, said distributor plate having an enlarged central opening, a locking cap on the distributor plate over said central opening, and a bolt extending from the cap to the spider through said enlarged hole whereby to normally secure the plate in fixed position but permitting of selective adjustment thereof transversely of the blower axis, and a discharge pipe leading from the blower.

2,623,661. Distributor for Particulate Material. Patent issued December 30, 1952, to Wallace B. Hurlbut, Cincinnati, Ohio. A spreader of particulate material such as seed, fertilizer and the like, adapted to be mounted on and driven by a tractor, comprising a hopper having a bottom, end and side walls, a rectangular conveyor frame disposed within the hopper and having one end thereof pivotally mounted immediately above the top of one of said end walls, a partition wall parallel to and spaced from each of the side walls, said partition walls extending from the end wall adjacent which the said frame is pivotally supported and terminating within the arc traversed by the swingable end of said frame in swinging towards and away from the bottom of said hopper, driving sprocket wheels supported on said hopper adjacent the pivotal support of said frame, one sprocket being aligned with the space between one side wall and its associated partition and the other sprocket wheel being aligned with the space between the other side wall and the partition adjacent thereto, there being a discharge opening between each of said driving sprocket wheels and the top of said one of the end walls, a sprocket wheel on each side of the swingable end of said frame disposed in alignment with the space between the respective side walls and the partitions, a sprocket chain running on the pairs of sprockets at each side of said hopper, the links of said chains having scraper elements attached thereto disposed to scrape particulate material in said hopper from the top surface thereof upwardly to said discharge openings as said sprockets are driven, the conveyor frame being unobstructed below said scraper elements, whereby the material in the hopper is drawn to the discharge openings by the chains and discharged therethrough, and means for receiving the discharged material and spreading the same along the ground as the hopper is transported.

2,621,143. Thiosulfenyl Dithiocarbarmates as Grain Insect Repellents. Patent issued December 9, 1952, to Lyle D. Goodhue and Carolyn E. Tissol, Bartlesville, Okla., assignors to Phillips Petroleum Co. A method for repelling insects which frequent grain and grain products which comprises applying a repelling amount of a thiosulfenyl dithiocarbamate to the locus from which said insects are to be repelled.

2,621,163. Pest Control Coating Compositions. Patent issued Dec. 9, 1952, to Conrad V. Coash, Chicago, Ill., assignor to Sherwin-Williams Co., Cleveland, Ohio. A pest lethal coating composition consisting essentially of from 1 to 6 per cent of a pest toxic agent, from 1 to 6 per cent of a solid amorphous binder in which said toxicant is soluble, and a volatile hydrocarbon mutual solvent therefor, a part of said binder being a styrene-butadiene copolymer in an amount sufficient to increase the viscosity of said composition and the remainder of said binder being an oil soluble acid catalyzed alkyl phenol formaldehyde resin in which the molar ratio of alkyl phenol to formaldehyde is within the range from 1:0.7 to 1:1.1, the weight ratio of total binder to said agent being not more than 2:1 and said solvent being in excess of 70 per cent by weight of the total composition and being characterized by a kauri-butanol value above 75.

2,622,975. Herbicide. Patent issued Dec. 23, 1952, to Arthur W. Swezey, Garden Grove, Calif., assignor to Dow Chemical Co., Midland, Mich. A herbicide composition comprising as active toxicants a mixture of from 1 to 5 parts by weight of monochloroacetic acid and 2 parts by weight of trichloroacetic acid, said toxic materials being present in the composition as members of the class of the free acids and their water-soluble salts.

2,622,974. Herbicide. Patent issued Dec. 23, 1952, to Percy W. Zimmerman and Albert E. Hitchcock, Yonkers, N. Y., assignors to Boyce Thompson Institute for Plant Research, Inc., Yonkers, N. Y. The plant composition for killing plants comprising chloroacetic acid in an amount varying from 0.3% to 10% and undecylenic acid in an amount varying from 0.3% to 10%.

2,622,976. Method of Treating Soil for Pre-Emergent Control of Weeds. Patent issued Dec. 23, 1952, to Albert E. Hitchcock and Percy W. Zimmerman, Yonkers, N. Y., assignors to Boyce Thompson Institute for Plant Research, Inc., Yonkers, N. Y.

The method of controlling the growth of weeds comprising the pre-emergence treatment of soil with an aqueous solution of chloroacetic acid in an amount varying from 20 to 40 pounds of chloroacetic acid per acre, the soil having been previously planted to seeds for the growing of a crop.

Trade Mark Applications

The following trade marks were published in recent issues of the Official Gazette of the U. S. Patent Office under the provisions of the Trade Mark Act of 1946. Any person who belives he would be damaged by the registration of any of these marks may, within 30 days after publication in the Official Gazette, file an opposition, or, if the 30-day period for filing an opposition has passed, petition for cancellation of the resultant registration may be filed.

Upon request, the publishers will be glad to furnish interested subscribers with a free copy of a booklet, "Trade Marks and Registration under the New Trade Mark Law." Address such request to Agricultural Chemicals, 175 Fifth Avenue, New York 10, N. Y.

Min-Organic, in Ultra-Bodoni capital letters, for fertilizers. Filed September 22, 1951, by Thomas D. Burnett, Sparks, Md. Claims use since Aug. 7, 1951.

Drum, in tall sans-serif capital letters for soil conditioner. Filed June 18, 1952, by Drum Chemicals, Inc., Brooklyn, N. Y. Claims use since July, 1946.

Plantspur, in hand-lettered capitals, in concave style, with center letters smaller than those on the ends, for fertilizers. Filed Feb. 23, 1951, by Garfield Williamson, Inc., Jersey City, N. J. Claims use since 1920.

Green Nutro, in heavy capital letters, for fertilizer. Filed June 5, 1951, by Eastern States Soilbuilders, Inc., Sharpsburg, Md. Claims use since Jan. 1, 1951.

Uana, in extra tall Onyx capital letters, for nitrogen-containing solution for use as fertilizer and in the manufacture of fertilizer. Filed June 26, 1952, by Allied Chemical & Dye Corp., New York, N. Y. Claims use since April, 1952.

Kling-Tite, in Stymie bold-face capital letters for compounds which influence specific physiological processes in plants. Filed Feb. 17, 1951, by California Spray-Chemical Corp., Richmond, Calif. Claims use since Dec. 18, 1945.

Green Phos, in sans serif capital letters, for fertilizer. Filed June 5, 1951, by Eastern States Soilbuilders, Inc., Sharpsburg, Md. Claims use since Jan. 1, 1951.

One Plant Plate, devised in the form of a figure one, with "plant below, for insecticide and fungicide having incidental properties as a fertilizer. Filed May 22, 1952, by Milligan Bros., Jefferson, Iowa. Claims use since Sept. 21, 1951.

AMMONIA MEETING

(*Continued from Page 50*)

tion of ammonia, the anhydrous ammonia is pumped directly into the water which in turn carries the ammonia into the soil.

Ammonia as Fertilizer

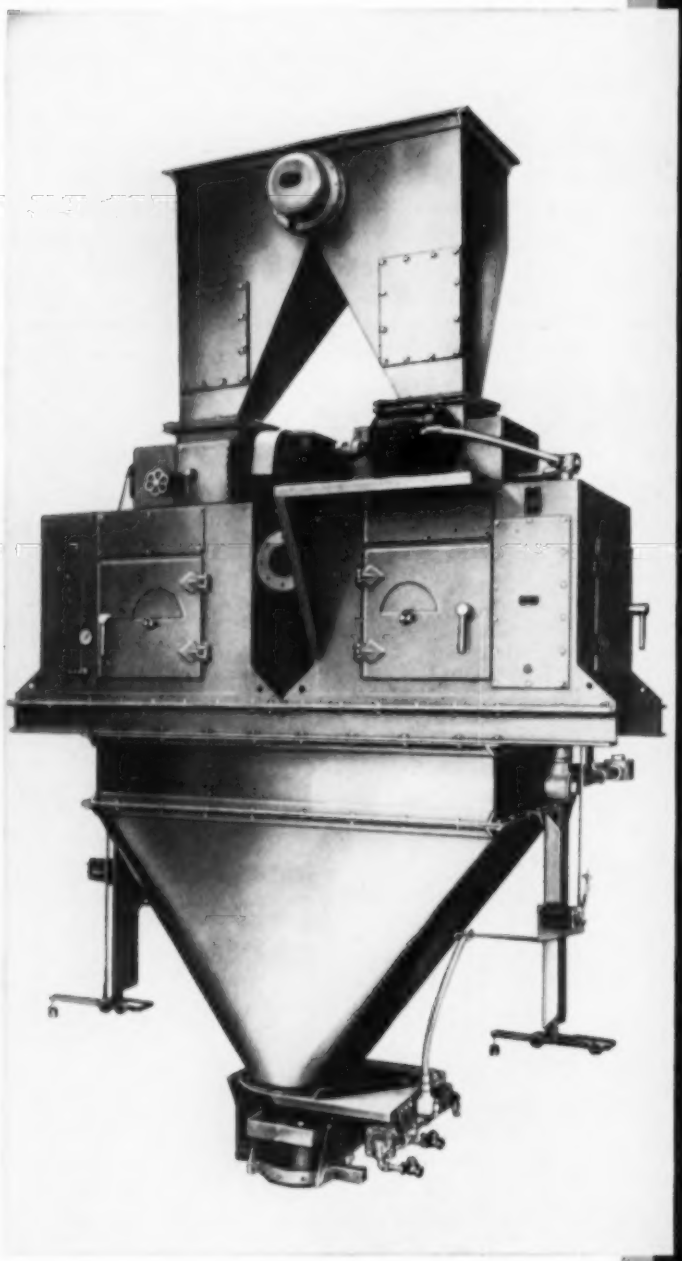
A particularly interesting report on experimental developments concerning the use of ammonia as a fertilizer, was presented by Dr. T.C. Longnecker of the Texas Research Found., Renner. According to Dr. Longnecker, results obtained at the foundation indicated that on a pound for pound basis, . . . one pound of nitrogen from anhydrous ammonia is the same as one pound of nitrogen from any other source. Under present conditions, however, anhydrous ammonia offers the most economic supply of nitrogen. According to one of the members of the AAI, anhydrous ammonia offers a supply of nitrogen at a cost of about $2.25 unit of N—whereas, sodium nitrate on the same basis, shows a comparative price of about $4.00 per unit of N.

Dr. Longnecker reported that because of the difference in rainfall, soil problems in Texas are different from those in other states. Winter grain and winter grasses give a particularly good response to ammonia fertilizer, but this, he explained, is due to the higher rainfall in winter and spring, and thus ready reaction of nitrogen in the soil. He reported also that side dressing of summer crops is not a paying proposition. Where nitrogen was used in a dry year, and there appeared to be no response in crop yield, a later examination evidenced a delayed action, since the succeeding crop produced the expected results.

To acquaint the membership with the chemical action of ammonia in the soil, Dr. Arthur B. Smith, Mathieson Chemical Co., Baltimore, Md. discussed the various types of clay and how they react with the soil. Briefly, the clay content of the soil is the important varying reactant with anhydrous ammonia in the soil. The different clays vary in ability to hold and absorb moisture such as anhydrous ammonia, which first tends to attach itself to any water present in the soil. A cyclic reaction in the soil consists of a breakdown of ammonia to nitrate to organic nitrogen, under the proper conditions of oxygen content, moisture and temperature. Still other factors affecting soil conditions are the amounts of available calcium, magnesium, potassium and sodium, as well as the pH of the soil.

Crop Applications

VARIOUS sectional reports by representative members reviewed crop applications of anhydrous ammonia. In general, it was recommended that the amount of ammonia used be determined by the moisture, humus, phosphate and potash content of the soils. On spring crops, it was recommended that ammonia not be applied in cold weather, but when the



Designed for bagging fertilizers with *speed* up to 20 50-lb. or 80-lb. bags per minute[1]; *accuracy* usually to the split ounce, with a maximum range of 2 to 4 ounces; *savings* to $15 per hour[2] using economical open-mouth bags . . .

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[1] Slightly slower on 100-lb. bags
[2] Cost analysis figures on request

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plants start to grow. As examples, for lettuce, apply before the plant folds, and again on next or last watering . . . . for cabbage, at 7 to 8 leaf stage, then again as head starts to form . . . for carrots, when fruit is the size range from pencil to finger. These recommendations vary somewhat for different soil conditions and areas, it was pointed out.

The amounts to use on different crops were reported as 50 to 120 pounds of NH_3 per acre for cotton; 100 to 200 pounds for corn; and about 50 to 75 pounds for oats. In a comparison of the various forms of nitrogen available, it was pointed out that where amounts of 15 to 20 pounds of nitrogen per acre are to be applied, a well balanced fertilizer may be most practical; however, where the requirements of the soil show that 50 pounds or more of nitrogen will give the best crop yield, anhydrous ammonia offers the most economical form of this product.

Dr. Edwin C. Kapusta, National Fertilizer Association Washington, D .C., reported on the "Potential of Fertilizer Use," and indicated that a greater availability of fertilizer is anticipated in '53, ... increases over '51, '52 being somewhat as follows: phosphates, 10%, nitrogen, 11%, and potash 17%. Furthermore, if state recommendations are followed, an even greater potential use of fertilizer will be realized. In a closing comment, Dr. Kapusta pointed out that farmers can make a greater profit on the soil by increasing fertilizer and plant food, than by farming additional land, even if the land were obtained at no cost.

Exibits Displayed

CO-featured at the three day meeting was a trade show by suppliers and dealers, exhibiting ammonia applicating, storage and handling equipment. Gotcher Engineering & Manufacturing Co., Clarksdale, Miss., featured its applicator which places liquid ammonia from four to six inches into the soil, and may be used with a sweep to help cover the ammonia. Liquid fertilizer distributors featured at the booth of the John Blue Co., Inc., Huntsville, Ala., showed designs for two-row and four-row outfits. A combination applicator and lister, for bedding the land and applying ammonia in one operation was described by the Leland Manufacturing Co., Inc., Leland, Miss. Control units, fittings, compressors, rubber fittings, etc, were shown at various other booths, including those of the Henry Valve Co., Melrose Park, Illinois; Howe Ice Machine Co., Chicago, Continental L-P Products Co., Dallas, and the Weatherhead Co., Cleveland.

A row-crop anhydrous ammonia applicator described by the KBH Corp., Clarksdale, Miss., featured penetration at any depth in the soil and an attachment which allows use of up to eleven applicator knives at 12-inch intervals for pasture and pre-planting work. Tractor tanks

were featured at the exhibits of Flint Steel Corp., Memphis, Tenn. and North Texas Tank Co., Denton, Texas.

In the course of the meeting, the membership elected eight directors to serve a three-year period beginning with 1953. The new directors are as follows: W. M. Banks, Farmer City, Ill.; W. D. Cook, Suburban Farm Service Gas Co., Whippany, N. J.; M. C. Craft, Midwest Fertilizer Co., Springfield, Ill.; K. Eldon, Continental L. P. Products, Dallas; George Gray, Vercamp Corp., Cincinnati; H. Pugh, Pugh Gin & Fertilizer Co., Tillar, Ark.; W. D. Tucker, John Blue Co., Huntsville, Ala.; and J. W. Whittington, Mathieson Chemical Co., Baltimore, Md.

ENTOMOLOGISTS

(*Continued from Page 48*)

vegetables, there would not be such a clamor against pest control, it was stated.

Despite the fact that achievements made by entomology in prevention of insect-borne disease—a development reported in 1945 as being second only to atomic fission as the major scientific advance made during World War II, the public at large considers this the work of the medical profession or the armed forces, or perhaps of "scientists" without any further designation. Not one person in ten knows what the term "entomologist" means, and fewer than that have any idea what an entomologist does, it was pointed out in the discussion.

This lack of understanding on the part of the public results in confusion and mistaken ideas about the objectives of the profession, Mr. Hall noted. For instance, varied control recommendations from one state to another are frequently misconstrued as being inconsistent, whereas varied ecological conditions make these differences necessary. Yet, the public doesn't know this. Lack of coordinated effort on the part of entomologists has made such misunderstandings possible, it was stated.

Concurrent with the panel on taste-testing Tuesday morning, were two other sections on cereal and forage insects and apiculture. The former, under the chairmanship of T. H. Parks, Ohio State University, Columbus, included the showing of a film on control of spittlebugs, and another on early season control of alfalfa weevil in mountain states. These movies, made by Hercules Powder Company, Wilmington, Del., were introduced by M. R. Budd. In addition, thirteen other submitted papers were presented.

The section on apiculture had as its chairman, W. A. Price, University of Kentucky, Lexington. Secretary was R. L. Parker, Kansas State College, Manhattan. Eight papers were presented at this section. At the same time, another section on plant pest control and quarantine was being held under the chairmanship of H. S. Dean, U.S.D.A., Washington, D. C.

and H. M. Harris, Iowa State College, Ames. Eight papers were scheduled for delivery here, also.

Tuesday afternoon's program included two concurrent sessions in addition to the final meeting on taste tests. A section of papers on forest, shade tree and ornamental insects was held with Floyd F. Smith, U.S.D.A., Beltsville, Md., in charge; and the other, a joint meeting between the A.A.E.E. and E.S.A. on teaching, was under the chairmanship of A. C. Hodson, University of Minnesota, St. Paul. Paul A. Dahm, Kansas State College, Manhattan, was secretary.

The latter session discussed how employers regard entomological training, with the viewpoints of a number of industries being voiced through representatives. Harry F. Dietz spoke for E. I. duPont de Nemours & Co., Inc., Wilmington, Del.; Dr. Bruce D. Gleissner for American Cyanamid Co., New York; William O. Buettner, for the National Pest Control Association, New York; Robert L. Metcalf, California Citrus Experiment Station, Riverside, for experiment stations; Dr. Fred C. Bishopp, assistant chief, Bureau of Entomology and Plant Quarantine, U.S.D.A., Washington, D. C., for the Bureau; Clyde F. Smith, North Carolina State College, Raleigh, for University teaching and research; and G. H. Bradley, Communicable Disease Center, U. S. Public Health Service, Atlanta, Ga., for the Public Health Service. Dr. Charles E. Palm, Department of Entomology, Cornell University, Ithaca, N. Y., summed up the remarks and led a brief discussion to complete the afternoon's meeting.

Three concurrent sessions were on the agenda for Wednesday morning, also, as the entomologists congregated on the Bellevue Stratford's eighteenth floor meeting lobby for the third consecutive day of sessions. The first of the two sections on medical entomology was held Wednesday morning with A.W.A. Brown, University of Western Ontario, London, Canada, chairman and Carroll N. Smith, U.S.D.A., Orlando, Florida, secretary.

An invitation paper, "A Teacher's Outlook on Medical Entomology" was presented by Dr. B. Travis, Cornell University, Ithaca, while fourteen submitted papers were presented to cover other phases of the subject.

Another section on fruit insects was held with Dr. H. M. Armitage, California Department of Agriculture, Sacramento, as chairman. Among the sixteen submitted papers presented at the session were studies on DDT resistance in the grape leafhopper; radioisotopes as tracers in plum curculio behavior studies; and observations on dieldrin residue loss from treated apple and peach foliage and fruit. The latter paper, presented by Dr. George C. Decker, Illinois Natural History Survey, Urbana, Ill., stated that fruits receiving one to three sprays containing dieldrin, 0.5 pounds per 100 gallons, (the last application not later than the first cover spray), were free of dieldrin residues well in advance of the harvest period. It was found in field tests extending

over three seasons, that the rate of dieldrin loss from the fruit and foliage of apples and peaches, represented a logarithmic function of time, the paper said.

Roy E. Campbell, U.S.D.A., Whittier, California, was chairman of a section on vegetable and garden insects. A dozen papers were heard at this session.

Wednesday afternoon's program saw a continuation of the section of medical entomology with Drs. Brown and Smith in charge. A total of seventeen papers was scheduled for this section. Concurrently, two other sections were under way. These included a section wherein submitted papers on miscellaneous entomological subjects were presented. Dr. C. P. Clausen, California Agricultural Experiment Station, Riverside, was chairman and twelve papers were scheduled for reading.

The third concurrent meeting was the Section of Insecticides, with Fred W. Fletcher, Dow Chemical Co. as chairman and C. R. Weaver, Ohio Agricultural Experiment Station, Wooster, secretary. A paper by E. H. Glass and S. E. Leink, New York Agricultural Experiment Station, Geneva, told of experiments made with various types of spraying equipment. Tests were made against dormant and summer stages of aphids and European red mite, codling moth, eye-spotted bud moth, first and second brood red-banded leaf roller and two-spotted mite. Seven pesticides were used, they said. Except for dormant and semi-dormant applications, complete high pressure spraying gave better control than airblast machines. Where trees were dense and undersurface leaf coverage necessary, airblast machines were less satisfactory. It was also noted that control efficiency in the case of several pests tended to decrease as the spray concentration was increased.

A second invitational paper was presented by Dale W. Jenkins and Charles C. Hassett, Medical Laboratories, Army Chemical Center, Maryland. It described some of the work being done toward the development of atomic materials for control of insects. While nothing of definite nature has been forthcoming in the study of fission products for pest control, tests indicate that there are possibilities in this field.

Three other submitted papers were presented before chairman Fletcher called upon industry representatives to introduce new materials or formulations which may be available for experimentation during the 1953 season.

Dr. C. C. Alexander, representing Geigy Co., Inc., New York, described a new material, "Diazinon," a phosphate compound said to show promise in the control of houseflies and other insects. It is O,O-diethyl-O - [2-isopropyl-4-methyl-pyrimidyl (6)] thiophosphate. Limited quantities of 25% wettable powder will be available to research entomologists during 1953.

A representative of Freeport Sulphur Co., New York, told the group that supplies of sulfur are am-

ple now, a number of companies having stepped up production to overcome the late shortage of the material.

Gordon Brandes, Rohm & Haas Co., Philadelphia, introduced a new product, "Q-137" Experimental, which he said is the ethyl analog of "Rhothane." It is expected to prove effective against hornfly, cattle lice and insects of fruits and vegetables. The new material has exhibited no phytotoxicity, he reported, and the toxicological tests thus far have been promising. The material apparently shows no tendency to store in fatty tissues and no trouble with its affecting flavor of fruits or vegetables is expected.

C. S. Harris, Prentiss Drug & Chemical Co., New York, introduced a new product, "3960-X14," also known as "Strobane," developed through cooperation with B. F. Goodrich Chemical Co. Some small distribution for experimental purposes is to be made during the 1953 season, he said.

In an evening session Wednesday, Dr. Glenn Richards, University of Minnesota, St. Paul, addressed the group on "Problems of Cuticle Penetration" and Dr. A. Earl Pritchard, University of California, Berkeley, spoke on "Biological and Taxonomic Aspects of the Mite Control Problem." E. Gorton Linsley, E.S.A. president, was chairman of the evening session, and H. Johnston, vice-president, A.A.E.E., acted as secretary.

Business sessions of the two participating groups occupied all of Thursday morning, and the final concurrent sessions of the meeting took up the afternoon period. Twelve submitted papers on insecticides were scheduled for the section on insecticides, with P. J. Reno, Hercules Powder Co. as chairman; and thirteen papers were on the program during the section on medical and veterinary entomology under the chairmanship of W. Doyle Reed, Department of the Army, Washington.

The annual entomologists' banquet was held Tuesday evening, with entertainment.★★

FUNGICIDES

(*Continued from Page 78*)

the plots dusted with copper, and 7.3 for the "Dithane" plots. The mean damage index, includes a factor assessing the extent of damage to each boll, was 5.0 for the plots with no fungicide, 7.7 for the copper treatment, and 5.3 for the "Dithane" treatment. On this scale, greatest possible damage was represented by 100.

A second test was conducted on the Upper Coastal Plain Branch Station Farm near Rocky Mount. At this location tribasic copper sulfate, "Dithane Z-78" (zineb), and "Orthocide 460" (50% trichloromethylthio tetrahydrophthalimide) each in combination with toxaphene insecticide, were applied with rotary hand dusters. The check plots received toxaphene only.

Six applications of these dusts were made, beginning on August 3 when the most advanced bolls were nearly full grown and continuing at weekly intervals to September 7 when many bolls were open. Boll weevil damage was high on top squares at the beginning of the test and subsequent dusting gave poor control of boll weevil and little or no control of boll worm.

At the conclusion of the test, the mean percentage of open bolls having locks damaged by fungi only ranged from 3.1 for the "Orthocide" treatment to 5.6 for the "Dithane" treatment, the check plot which received no fungicide having 3.4 percent damaged bolls. A much higher percentage of the bolls showed some degree of fungus damage associated with insect injury largely by boll worm activity. These percentages ranged from 39 on the "Orthocide" plots to 42 on the control plots which received only toxaphene. Neither of the three fungicides reduced fungus damage significantly on the bolls which had also been damaged by insects.

Less than 1 percent of the open bolls examined for any treatment showed insect damage unaccompanied by fungus damage. Only a relatively small percentage of the opened bolls appeared to have been damaged by fungi that entered through cracked sutures at the tip of the boll. However, a large percentage of the diseased bolls appeared to have been damaged by fungi which entered through insect injury at or near the base of the boll. In a considerable proportion of the bolls exhibiting damage by both boll worm and fungi, the insect had not actually entered the boll but merely had chewed the outer surface at the base of the boll and had thus provided a place of ingress for the fungi which subsequently damaged the seed and fiber. This circumstance indicates the great importance of insects in development of fungus damage to seed and fibers of cotton bolls. The fungicides used in these tests gave no reduction of fungus invasion through insect injuries. Reduction of this type of damage would seem to depend on elimination of the antecedent insect injury.★★

RECOMMENDATIONS

(*Continued from Page 35*)

tumidus Banks; the Shoen spider mite, *T. schoenei* Mc G.; the Canadian spider mite, *T. canadensis* (Mc G.); and the brown wheat mite *Petrobia latens* (Mueller). These species differ in their effect on the cotton plant and in their reaction to acaracides. Accurate identification of the species involved is essential.

The two-spotted spider mite, *T. bimaculatus* is the most difficult species of spider mite on cotton to control. It occurs as the green form in many areas and as the carmine form (*T. multisetis*) in the South and Southern California. The green form can be controlled by applications of Systox of 0.25-0.50, aramite at 1, and ovotran at 2-3 pounds per acre. Sulphur, TEPP, parathion, rualathon and EPN do not give effective control of green form. Parathion at 0.10-0.40, aramite at 1, ovotran at 2-3, and systox at 0.25-0.40 pounds per acre give effective control of the carmine form.

The pacific spider mite, *T. pacificus*, is restricted to the Pacific Coast where it has been a major pest of cotton. Sulphur at 60, systox at 0.25-0.40 ovotran at

2-3, and aramite at 1 pound per acre give effective control of this species. The organic phosphates are not satisfactory.

The atlantic spider mite, *T. atlanticus*, feeds in restricted colonies and causes strawberry-colored spots on the upper surface of the leaves. The bottom of the plant is attacked first and comparatively few mites can cause severe defoliation. Sulphur at 10-15, parathion at 0.3, systox at 0.25-0.40, ovotran at 2-3, and aramite at 1 pound per acre give effective control.

The desert spider mite, *T. desertorum* (*S. texazona*) and the tumid spider mite, *T. tumidus*, are controlled by applications of sulfur at 20-25, parathion at 0.1 to 0.25, and aramite at 0.3 to 0.75 pounds per acre. TEPP at the rate of 0.5 pint of the 40 per cent concentrate, or its equivalent, gives control of these species but several applications may be required.

The brown wheat mite, *Petrobia latens*, may attack seedling cotton. Sulfur at the rate of 50 pounds per acre during warm weather and parathion at the rate of 0.3 pound per acre during cool weather control this species.

In some areas where mites are a problem, they may be effectively controlled by including comparatively low rates of acaracides in all applications of cotton insecticides. For control of some species and as a depressant for others, at least 40 per cent sulfur may be incorporated in all dust applications. Elemental sulfur cannot be incorporated in sprays applied at low gallonage. Other acaracides may be substituted.

Sulfur is most effective when finely ground and when applied at temperatures above 90° F. Thorough coverage is essential for effective results in the use of acaracides.

Thrips. Thrips often cause injury to cotton seedlings, especially in areas where vegetables, legumes, and small grains are grown extensively. In some areas it has been shown that cotton plants usually recover and controls are not recommended, unless the stand is threatened. In other areas, to the contrary, it has been shown that thrips damage is more severe than generally realized. Although thrips injury is usually found on seedling cotton, damaging infestations sometimes occur on older cotton in certain areas.

A number of insecticides properly applied give satisfactory control of thrips and are recommended when the situation warrants their use. Toxaphene at the rate of 0.75 to 3 pounds of the technical material per acre in either dust or spray form, gives effective control. A spray mixture consisting of 0.5 pound of toxaphene and 0.25 pound of DDT per acre, or a dust or spray mixture of DDT and BHC applied at a rate of 0.05 pound of gamma isomer plus 0.25 pound of DDT, per acre is also effective.

Heptachlor or aldrin applied to young seedlings as a spray or dust at the rate of 0.08 to 0.125 pound per acre gives good thrips control. Dieldrin applied at the rate of 0.05 to 0.25 pound per acre is very effective.

Other insecticides that give satisfactory control either as a spray or a dust are chlordane at 0.5 to 1 pound per acre, BHC 0.1 to 0.2 pound of gamma isomer, and DDT 0.25 to 1.5 pounds. DDT has not given satisfactory control at temperatures above 90° F. Sprays are more effective than dusts for thrips control on seedling cotton. When applications are made by airplane, the dosages mentioned above should be increased by at least 50 per cent.

Some of the phosphate compounds are effective against thrips, but are not generally recommended because they are extremely poisonous.

Tobacco Budworm. This species represents an important part of what has been referred to as the "bollworm complex," in the states from Texas eastward. In this area the budworm is usually more abundant on cotton than the true bollworm during the early part of the fruiting period. As the season progresses the relative abundance of these two species gradually changes. By the time cotton matures, abundance of the two species is roughly the same in the Carolinas, while in Texas the budworm has reverted to a position of minor importance.

So far as is known, controls which are effective against the bollworm on cotton are equally effective against the tobacco budworm.

Cotton Insect Control in Irrigated Southwest

COTTON insect problems in the irrigated Southwest are somewhat different from those in the remainder of the Cotton Belt because of differences in climate, cultural practices, and kinds of insects present.

The combination of alkalinity, intense sunlight, high temperatures (regularly over 100° F. and frequently exceeding 110° F.), low humidity, and in most areas an absence of precipitation during the growing season make the environment of the cotton plant and its pests quite different than that in the South. Furthermore, this environment is complicated by intermittent irrigations which bring severe changes to the environment. The large size of most Western ranches and fields complicates insect control in some ways and simplifies it in others. Also such cultural practices as double cropping, extensive use of commercial fertilizers, mechanical picking and one variety districts modify insect problems in the S. W.

These factors in conjunction with local and general isolation give the Southwest a different insect complex. The boll weevil, pink bollworm and cotton leafworm are absent or are only local problems. The most important pests are lygus bugs, the bollworm, three species of spider mites and several stink bugs. Early season pests are wireworms, seed corn maggot, darkling ground beetles, cutworms, beet armyworms, white-lined sphinx, flower thrips and spider mites. Thrips, although very abundant, do not seem to cause serious damage unless the stand is threatened. In mid-season the three species of lygus bugs and other mirids are easily controlled with DDT. The bollworm has been increasing in importance over the past five years but very satisfactory control can be obtained with DDT if treatments are properly timed. Certain systemics show great promise on spider mites but further research is needed. A number of minor pests attack cotton in the irrigated areas during mid-season and late-season. They include the salt-marsh caterpillars, bean thrips, western yellow-striped armyworm, cotton aphid, cotton leaf perforator, white flies and cabbage loopers.

In general, in the Southwest insecticides are applied less frequently but in larger amounts than in other parts of the Cotton Belt, i.e., the pounds are higher (15 to 35 pounds per acre) and the actual toxicant per acre slightly higher. Nearly all treatments except early applications are applied by aircraft. Predators and parasites seem to be particularly important on pests of cotton in the Southwest and every effort is made to protect them and to utilize them fully.

Supervised control has been increasing in its importance especially in California. This is a system of entomological field supervision in which the fields are scouted on at least weekly intervals by unbiased and specially trained personnel. Every effort is made to take advantage of beneficial insects, to apply the latest control information to the particular situation in the individual field, and to give the farmer a recommendation especially tailored to his conditions.

The combination of a simpler insect problem, favorable growing conditions, controlled soil moisture, and an intensified agriculture produces the greatest yields of cotton in the world.

CHEMICALS & FLAVOR

(*Continued from Page 31*)

or reject a pesticide on the basis of off-flavor for questioning its safety in this respect when the literature reports off-flavor. Unless the taste tests have been run according to a published method, all the factors that may have contributed to off-flavor should be recorded.

Too much emphasis cannot be placed on the importance of including all the data in a report covering taste tests run by untrained personnel, especially if the results are negative. Dozens of favorable reports are required to offset one negative report and an undue burden is placed on the manufacturer of pesticides if the negative results are not based on facts.

The road to acceptance for use of new pesticides has been rough and very costly. The compilation of acceptable off-flavor data is only one of the many requirements demanded of the pesticide manufacturer before a product can be marketed. It is hoped that with the interest in and consideration of off-flavor phenomena by competent food technologists and scientists trained in organoleptics, a reasonable solution to this problem can be worked out.

Industry is vitally interested in all factors that will influence the marketability of a new product. Off-flavor is certainly one of these factors. It is important that we know the facts but we should not be penalized because of imaginary problems.

This symposium is the first to consider organoleptics on a national scale and intelligent consideration of problems involved can do much to unravel some of the uncertainties and confusion existing at present.★★

Calspray Names Dr. Fisher

The appointment of Dr. R. A. Fisher as district manager for California Spray-Chemical Corporation's new district, comprising the states of Arizona, New Mexico and Western Texas, has been announced by A. W. Mohr, president. Dr. Fisher was formerly the company's research coordinator at the company's head office in Richmond, California. In his new position which became effective November 1, Dr. Fisher makes his headquarters at Phoenix, Arizona.

Dr. Fisher received a Master of Science Degree in entomology at the University of Idaho, and in 1937 completed his Ph. D. in entomology at Iowa State College. He then worked with the United States Department of Agriculture in the Bureau of Entomology and Plant Quarantine for 1-½ years. His next position was at the University of Idaho as an entomology instructor.

In 1946, after serving as a captain in the army, Dr. Fisher joined Calspray as a technical fieldman in Washington State.

•

Fitzgerald to Atlanta

B. J. Fitzgerald, Julius Hyman & Co. Division, Shell Chemical Corporation, has been transferred from Denver, Colorado, to Atlanta, Georgia, as field representative for the product and sales development department, according to F. W. Hatch, division manager. At his new location Mr. Fitzgerald will be concerned with experimental and development work in the Southeastern states on the company's soil fumigants, "D-D" and "CBP-55".

NEW LAWS

(*Continued from Page 43*)

$2 per brand remains in force for packages of commercial fertilizer containing over ten pounds. In addition, an inspection fee at the rate of 20 cents per ton for these sized packages continues. This fee is based on quarterly tonnage reports submitted on the first day of April, July, October and January. In the case of packages of commercial fertilizer containing ten pounds or less, an annual registration and inspection fee of $50 for each brand sold is required in lieu of the $2 registration fee and the 20 cents per ton inspection fee.

In addition to a statement as to weight, brand, and name and address of the manufacturer, labels must show the guaranteed analysis showing the minimum percent of plant food in the following form:

1. Total nitrogen
2. Nitrogen in the form of nitrate (if claimed) (expressed as percent of total nitrogen in multiples of 5)
3. Water insoluble nitrogen (if claimed) (expressed as percent of total nitrogen in multiples of 5)
4. Available phosphoric acid
5. Soluble or available potash
6. Total magnesium oxide (if claimed) (fertilizer branded for tobacco must be guaranteed to contain a minimum of 2 percent magnesium oxide unless otherwise specified by the Board of Agriculture and Immigration)
7. Chlorine (if claimed) (fertilizer branded for tobacco must state the maximum percent of chlorine present)
8. Boron (if claimed) (guaranteed in terms of pounds of borax equivalent per 100 lbs. of fertilizer in increments of ¼ lb., ½ lb., 3 lbs. per 100 lbs., unless otherwise specified by the Board)
9. Other plant food guarantees
10. The acid-forming or non-acid forming property (potential basicity or acidity must be expressed as equivalent of calcium carbonate in multiples of 5 percent or 100 lbs. per ton)★★

FUNGICIDES

(*Continued from Page 42*)

Our knowledge of the various forms of synergism and antagonism occurring in fungicidal combinations is too meager to enable a field applicator of fungicides intelligently to plan a spray test of very many combinations. Synergism has been reported between some forms of copper and metallic oxides such as zinc, lead, and iron, and it is well known that various metallic oxides may synergize some of the carbamates. It is also known that synergism occurs between sulfur and cuprous oxide. Antagonism is known to occur between cuprous oxide and magnesium oxide. Other materials, such as mercaptobenzothiazole, are antagonized by zinc oxide.

The combination of several fungicides seems to be left too often to the curiosity of the field experimenter. As our knowledge of the effectiveness of such combinations increases, perhaps the formulators of commercial fungicides will be able to utilize this knowledge and produce improved pesticides in which two or more active ingredients are used together with the proper additives.

In summary, it would seem that more adequate testing when the material is in the early stages of development may greatly aid the applicator in his field experiments. Also it would seem advantageous if manufacturing formulators would consider the specialized requirements sometimes needed for the control of certain diseases. In some fungicide formulations, it may well be that attention should be given to particle size of the active ingredient, wetting agent, spreader stickers, safeners, deposit builders, and anti-foaming agents. In other formulations, perhaps only one or two spray supplements may be desirable. It may also be well to utilize the possible effect of formulating more than one active ingredient in combination, or also using some other chemical known to have synergistic effects.★★

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Colorado Group Eletes

Claine E. Titensor, manager of agricultural chemicals, of Agricultural Processing Industries, Denver, Colorado, is the new president of the Colorado Agricultural Chemical Association which concluded a two day meeting at the Cosmopolitan Hotel in Denver on December 5th. Mr. Titensor succeeds Carl Dewey, manager of agricultural chemicals of the C. D. Smith Company, Grand Junction Colorado, as head of the trade association composed of all Colorado manufacturers and distributors of agricultural chemicals.

Other new officers announced at the annual banquet were Sam McCampbell of Eaton, Colo., as vice-president and W. D. Smith of Lakewood, Colo., as secretary-treasurer. The other members of the board of directors for the next year are Dr. B. Thomas Snipes and Dr. W. E. McCauley, both of Denver.

The Association members met with Paul Swisher, Commissioner of Agriculture of Colorado and a group of Colorado A & M College experts to discuss and correlate recommendations for farmers' use of agricultural chemicals for the 1953 season.

FERTILIZERS

(*Continued from Page 40*)

level and the use of makeweight filler at less than half the level in that year.

From previous studies (*1, 2, 8, 12*) it appears that at present, the total average cost to the farmer of makeweight filler in mixed fertilizers is approximately $20 per ton of filler material. This comprises manufacturing and distribution costs(including manufacturer's profit and dealer's compensation) and the cost of the filler materials delivered to the mixing plant. On this basis, the reduction in miscellaneous materials under premise D (level of primary nutrients at 30.8 percent) relative to

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premise B (26.9 percent of nutrients) represents a potential saving of $50,640,000. Likewise, under premises C and E, the savings would be $36,660,000 and $64,620,000, respectively.

With the large increase in the supply of high-analysis materials anticipated for 1954-55 an average nutrient level of 30 to 31 percent in mixed fertilizers is practicably feasible. Attainment of this level within the next few years will require, however, the intensified and coordinated effort of government agencies, the fertilizer industry, and other public and private organizations. Among many other things, much more attention will have to be given to the problem of physical condition in mixed fertilizers. Greatly expanded production of granular mixtures will be a highly important factor in the solution of this problem.

Summary. It is estimated that by 1954-55 the total supply of fertilizer materials available for manufacture of mixed fertilizers will amount to some 15.5 million tons containing an average of nearly 35 percent of primary nutrients (N, available P_2O_5, and K_2O). This compares with the use of nearly 11.2 million tons of primary nutrient materials, averaging about 30 percent of nutrients, in mixed fertilizers in 1950-51.

The mixed fertilizers consumed in 1950-51 averaged 24.2 percent in primary nutrients and about 20 percent in miscellaneous materials—limestone, trace nutrient materials, inert filler, and other substances not supplying primary nutrients. At the rate of increase in the nutrient level during the period 1946-47 to 1950-51, the average nutrient concentration of mixed fertilizers would increase to nearly 27 percent in 1954-55, but the content of miscellaneous materials would also increase to 23 percent.

An average concentration of 30 to 31 percent of primary nutrients in mixed fertilizers in 1954-55 is considered to be practicably feasible. Compared with a level of 27 percent, realization of this concentration would require that the content of miscellaneous materials be reduced from 23 percent to approximately 12 percent. This could be accomplished by the elimination of some 2.5 million tons of makeweight filler, with an estimated saving of more than $50,000,000 in the cost of mixed fertilizers to the Nation's farmers.★★

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Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 175 Fifth Ave., New York 10. Closing date: 25th of preceding month.

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Advertisers' Index

(The Advertisers' Index has been checked carefully but no responsibility can be assumed for any omission)

MEETING CALENDAR

Pacific Northwest Vegetable Insect Control Conference. Imperial Hotel. Portland. Oregon. Jan 19-21.

California Weed Control Conference. Hotel Ste. Claire. San Jose. Calif., January 20-22.

Western Cooperative Spray Project. Imperial Hotel. Portland. Oregon. January 21-23.

North Carolina State Pesticide Conference. N. C. State College. Raleigh. N. C., January 22 and 23.

Cotton States Branch. AAEE. meeting with Louisiana Entomological Ass'n.. Jung Hotel. New Orleans. La., February 9-11.

California Mosquito Control Conference. Odd Fellows' Hall. Sacramento, Calif., February 10-13.

Midwestern Chapter. National Shade Tree Conference. Cosmopolitan Hotel. Denver. Colo., February 11-13.

Southern Weed Control Conference. Jung Hotel. New Orleans. La., February 12 and 13.

Midwest Soil Improvement Committee meeting with Industry and Colleges. Palmer House. Chicago. February 20.

Alabama Pesticide Short Course. Auburn. Alabama. February 24 & 25.

Southwestern Branch. A.A.E.E., Galvez Hotel. Galveston. Texas. February 26-27.

National Agricultural Chemicals Assn., Jung Hotel. New Orleans. La., March 11-13.

American Chemical Society. Pesticide Division. Hotels Statler and Biltmore. Los Angeles. Calif., March 15-19.

North Central States Branch. A.A.E.E., Statler Hotel. St. Louis. Mo., March 19 and 20.

American Plant Food Council. The Homestead. Hot Spring. Va., June 11-14

National Fertilizer Association. Greenbrier Hotel. White Sulphur Springs. W. Va., June 15-17, 1953.

Tale Ends

HOW very much the staff of *Agricultural Chemicals* enjoyed the holiday greeting cards sent us from friends in many states and a number of countries outside the U.S. Since it is impossible to acknowledge each one personally, we take this means to let each sender know that his greeting was noted and appreciated. For several days around Christmas time, the editor found it difficult to get his work done with the desk just about smothered in friendly notes; but it is always a very enjoyable task to read them all!

•

A considerable amount of kidding was directed to Dr. E. F. Knipling, A.A.E.E. president, at the Association's recent meeting in Philadelphia. On his coat lapel was a tag identifying the wearer as a "visitor" at the convention, but he explanied that at the time he registered the girls were temporarily out of the "member" badges.

Florida fish story: This foursome, Mr. and Mrs. Wm. K. Self, Riverside Fertilizer Co., Marks, Mississippi; and Mr. & Mrs. Wm. E. Merritt, Atlanta, Ga., went angling off the Florida Keys following the recent NFA convention at Miami Beach. Each of the ladies received citations for their catches. Mrs. Self (left) landed a mackerel of near record size, while Mrs. Merritt captured the 6ft. 4 inch sailfish seen in the photo. All the fish in the picture were caught in one day's haul, Mr. Merritt reports to *Agricultural Chemicals*.

•

Entomologists who attended the annual banquet in Philadelphia will probably be more conscious of remembering names from now on. As part of the entertainment of the evening, a memory expert, after inquiring the names of some 125 persons at the banquet, proceeded to identify every one of them an hour or so later. After promising a gift of $5 to anyone of this group whose name he couldn't call, only one person collected. The entertainer roamed through the crowd pointing at various persons, calling their names correctly while everyone waited patiently and in vain, for him to err.

•

When chairman Fred W. Fletcher announced that a paper would be presented by Dr. E. W. Hinreiner, University of California, the good-sized crowd on hand that day was heard to gasp a little in surprise when Dr. Hinreiner turned out to be an an attractive young lady. We don't know, of course, just what the entomologists expected to see, but it seems reasonably certain that the surprise was a pleasant one.

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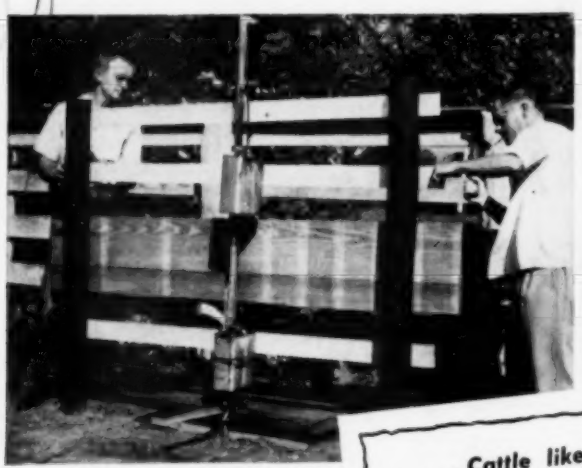

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